

July 1990

NEWS

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MODEL AIRPLANE NEWS

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ON THE COVER: Revisiting the cover of Model Airplane News is one of hundreds of paintings by world-recognized artist Jo Kotula, whose ability to convey the essence of aviation is unrivaled. Examine the Lockheed F-94 Starfire off the starboard wing of the still-operational Northrop T-38 Talon, and—through Jo's eyes and brushes—you'll get the feeling that you're there!

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EDITORIAL

by RICH URAVITCH



THE 2ND ANNUAL Top Gun competition was held this year in Mesa, AZ. I'll bring you a full report in a future issue, but let me share some of my observations now.

This event brought together some of the best R/C scale modelers in North America! Competition was stiff—nearly as stiff as the wind, which blew *across* the runway much of the time. These were far from ideal flying conditions, but the competitors took it in their stride, and it became evident which had spent time practicing under less-than-perfect conditions!

For the first time, I noticed the media's "can't-miss-this-story" attitude. On Thursday (practice flying and day one of static scoring), a local newspaper reporter visited the field, did interviews and took some photos. Later that day, a Phoenix TV station covered the event in a short spot on the evening news. Did that ever get attention! The next day, other press and TV people were on hand, more coverage was aired and more interest generated. The result?—huge crowds, mostly of non-modelers, turned out on Saturday and Sunday! What a shot in the arm for the hobby! This is exactly the kind of exposure we need.

I was interviewed by one reporter, who was amazed at what was going on around him. He said he couldn't believe what model airplanes now represented. The event obviously got his attention, and I hope he'll tell other non-modelers what we're all about. We owe it to ourselves, so take every opportunity to tell the world!

Before you write to say that you've been looking for the "Finishing Heli Bodies" article I promised for this issue, save the paper and postage! It's not here, because I goofed, but it will be in the next issue. Sorry!

Every editor looks for the chance to "scoop" the competition: it's a challenge, and success is very satisfying. We think we've done it by presenting Datu Ramel's in-depth "Pad & Bench" on the new, .15-powered, Hirobo MH-10 helicopter. It's a whole new size category of machine—a clear indication that interest and activity in R/C helis is on the upswing. I hope you enjoy it! ■

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duke's mixture



I am sure that you know of, and maybe have had, an old, well browned motor that seemed to run just a little bit better than any of the others of the same make around it. I have come to feel that the magic ingredient these occasional extra eager motors have is related to the effectiveness of the crankcase seal. When a piston comes down, the gas in the crankcase is compressed in preparation for the bypassing. If the case is not tight, some of this gas escapes and there goes part of your power. "But where does it go?" you ask. "My rear cover gasket is absolutely tight, and I am sure it is not leaking." Well, there are several other places case pressure can go. One is out alongside the crankshaft and into the intake. One is up between the skirt of the piston and the inside of the liner and out the exhaust port. "So," you say, "Let's make these fits tight so the gas can't escape." That is fine, except that when you get the surfaces too close together, friction goes up and the power output goes down. Make it too loose, and you lose case compression. A large number of experiments over many years has brought me to the conclusion that the residual castor oil in the motor will effectively seal a clearance up to .0015 (.003 on the diameter). With some of today's very thin fuels, using low viscosity synthetic lubricants, this critical clearance would be smaller. As a matter of experience, we have arrived that .0015 to .002 being a good crankshaft clearance, .002 being a good piston skirt to cylinder bore clearance below the ports, and .001 being a good case to cylinder clearance. In the case of racing motors or high performance motors, we tend to make these looser.

Now, a lot of our customers like to take their motor apart and clean and inspect all the parts, and sand off any rough surfaces or carbon build up. What happens? The clearances get a little bit greater. Sometimes there may be a burr or piece of grit or sand. This will abrade a little bit more out of the sleeve, and a little bit more off of the piston, resulting in a little bit more clearance. Also, putting the motor back without coating the surfaces with castor oil causes a little more leakage. The synthetic lubricants often used today with their high detergent characteristics, prevent any carbonized oil build up which would normally help fill and seal these leakage areas. My advice is do not remove a crankshaft or a cylinder or piston unless it is really necessary. If your motor gets a snoot full of dirt, I suggest cleaning it by removing the rear cover and the plug, and immersing it in Stoddard solvent, and sloshing it around and turning the motor over.

Now, on another problem. We get quite a few complaints about glow plugs burning out. In 9 out of 10 cases, it turns out that the user has built himself a power panel in which he uses resistors or a rheostat to bring the starter battery voltage down to glow plug voltage. This is fine if you are able to tap one cell of your battery, and use resistors and/or rheostat that have a 10 amp rating. But if you use a rheostat and resistors having only a 4 or 5 amp rating, or less, what happens is that you find your adjustment after the resistors and rheostat have warmed up considerably. Then when you are ready to fly, and they have cooled off, the resistance drops considerably, and when you connect the plug, you get a rush of power, which overheats the plug element. I recommend that you never build a power panel pulling the full battery voltage down to the 1.1 volt the plugs want. Tap into just one cell and then use rheostat and/or resistors that have at least 10 amps rating.

Duke Fox



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AIRWAVES

WHERE TO WRITE TO US: If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves" Model Airplane News, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.

KOTULA FAN (ONE OF MANY!)

It has been a while, but I've come home to MAN! I started reading it in 1950, and although I was in and out of free-flight during my adolescence, I kept reading "The Magazine." I still recall Jo Kotula's marvelous covers and how well you stayed on top of the hobby news.

My favorite cover is from the early '60s—the bright orange-and-white Grumman Gulfhawk F3F-1. (If I recall correctly, that issue also had Bill Northrop's Square Hare.) I would love to have that cover art now, but I gave away my collection about 10 years ago!

I'm back in the hobby and trying my hand at R/C. I used the Pulse Commander from Ace R/C, but it was on 27mHz and is now out-of-date. I've bought a Duraplane so I can learn to fly. (I already know how to build.)

Thanks for still being there for me and others like me. Keep it up; we need you!

PHIL ST. CLAIR
Eugene, OR

Phil, we intend to keep it up for as long as you folks want us to, because we need you as much as you need us—probably more! Jo Kotula was an integral part of MAN's early days, and we hope that Rick DeMeis' story and Jo's covers in this issue bring back fond memories for all our long-standing, loyal readers. Thanks from the entire Model Airplane News team.

RAU

SEEKING SAILPLANE SOLUTIONS

I've only been an R/C pilot for 10 months, so I haven't yet established a wide base from which to gather valuable R/C information. Model Airplane News is a regular on my cluttered desk, and it's an excellent reference

source. Unfortunately, it isn't enough. I'm looking for a wide range of materials, because I'm eager to learn.



From the publishers of Model Airplane News Magazine

I'm a slope soarer. I intend to try flying powered planes some day, so the information I get out of MAN is being stored in empty brain cells for future use! Meantime, I think it would improve your magazine if, in the spring and summer, you ran more articles on sailplanes and soaring. (I noticed the article on the Sophisticated Lady, but I've only looked it over briefly.)

So far, the only information I've found on sailplanes is for "the first project." I'm looking for a book or magazine that deals with flying, e.g., techniques, pointers and what weather conditions and terrain to look for. Does a good book exist?

I often see plans with very enticing prices advertised in your magazine, but I hesitate to buy them because I don't know how much more I'll have to spend to complete the project. It seems that kit planes would be more expensive than planes with comparable characteristics that you put together yourself. Would it be possible to include an estimated cost of the building materials for planes that are sold only as blueprints? I realize that material varies

(Continued on page 10)

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AIRWAVES

(Continued from page 8)

in price according to quality and where you buy it, but a rough estimate should be possible.

LARRY NATI
Oakland, CA

Larry, if I didn't know better, I'd swear that someone from our Book Sales Department wrote your letter! It seems you may be too engrossed in the technical side of MAN to look at our ads! Our "Basics of Radio Control Sailplanes" might be just the type of book you're looking for: other newcomers to R/C soaring seem to think so.

The range of material prices, plus the fact that many modelers have "scrap bins" from which to draw, makes it difficult to establish what a project will ultimately cost. We encourage the designers of the scratch-built models we feature to provide a bill of materials, but many lose track after the first balsa buy! RAU

JETS, BUT NOT DUCTED FANS

My father recently told me that he flew Jet-X engines at my age (16). I've noticed Jet-X kits in hobby stores, but when I ask the people working there if they sell the engines or know where to get them, they say they've been discontinued. Can you tell me if these engines are still around and where I might find them?

JOE BUTLER
Berwyn, PA

Joe, you're probably luckier than most, having a store nearby that stocks Jet-X kits! The motors are still available, as are fuel and a selection of kits. Two sources come to mind: Polk's Modelcraft Hobbies, 346 Bergen Ave., Jersey City, NJ 07304; and DoyleJets, P.O. Box 60311, Houston, TX 77205. Check with them for additional help. Jet-X flying is great fun!

RAU

SMALL FAN SEARCH

I've built 14 airplanes, four of which are ducted fans—fiberglass, 6-foot monsters that require 200-foot paved runways and zillions of gallons of gas! I'm looking for something a lot smaller! Does anyone manufacture a fiberglass or blow-molded ducted fan that's less than 45 inches? What about a high-quality wooden kit? I prefer semi-scale, modern naval planes like the F-18 or F-14.

EDWARD TAYLOR
Toronto, Ontario, Canada

Ed, I also have a 6-foot fan—it cools the attic of my house during the summer! When it comes to smaller fan-powered airplane kits, I'm afraid you might end up being happy with your 6-foot monsters. There's simply not much out there to choose from: no one makes kits in smaller sizes because the fan units aren't readily available. Two sources for smaller units (.09 to .25-size) that also sell kits are Kress Jets, 4308 Ulster Landing, Saugerties, NY 12477; and Southeast Model Products, 3933 Sport of Kings Rd., Florissant, MO 63034. Paul's Flying Stuff (P.O. Box 121, Escondido, CA 92025) offers a nice, downsized F-86 Sabre.

RAU

OF BEAVERS, OTTERS AND NORSEMEN

A few years ago, there was an article in *Model Airplane News* about Unionville Hobby's kits of giant-scale R/C planes. I'm interested in the Beaver, the Otter and the Norseman. Are they still available? Who can I contact about the Unionville Hobby line?

I've enjoyed your magazine since the '50s. It always has good articles and construction hints.

ALAN HILL
Lincoln, NE

Alan, as far as we know, the kits you seek are still available. Contact Unionville Hobby at P.O. Box 135, Markham, Ontario L3P 3J5, Canada.

RAU

ULTIMATE FAIL-SAFE RADIO?

Would you please print some suggestions on how to install a failure-proof radio system? I'm a 13-year-old beginner, and I've already crashed a Chipmunk and a Hots II because of radio failure. I have a jet that's almost done, and I would like to keep it whole until I've had good use of it! How come 2-strokes seem to crash more often than 4-strokes? Are jets *always* fast? And how much load is put on flying surfaces? Do they ever break off?

DAMON MCMILLAN
Ukiah, CA

Sorry, Damon, but there's no such thing as a failure-proof radio system! If you've determined, beyond any doubt, that radio failure caused the demise of your Chipmunk and Hots, you've probably been able to pinpoint the exact reason for that failure. If it was electronic, send the system back to the manufacturer, and to help them troubleshoot, give a full description of what happened. If, on the other hand, failure was the result of an installation problem, ask more experienced modelers for help. Any installation method should ensure that the radio is well-insulated from destructive vibration. The preferred methods are usually described in the radio manufacturer's instructions.

Two-strokes probably seem to crash more often than 4-strokes because there are 10 times as many of them in use! Jets aren't always fast: the average ones fly in the 90 to 120mph range, and the hottest exceed 200mph. A lot. Yes. And thanks for the letter!

RAU

BEGINNER'S BLUES

I wonder why, in every hobby I've been involved in, the hobby magazines ignore beginners. This appears to be true of *MAN*, too. In one issue, you printed a glossary—with comical definitions! The space could have been better used on a *real* glossary for newcomers. The hobby should be promoted more, but to pros or beginners? And the prices! In model railroading, there's a gradual cash outlay as you progress: table top, road bed, track, scenery, etc. In model airplanes, it's a one-shot layout of nearly \$300 for kit, engine, radio, covering and accessories. How can you promote the hobby? Prices are outrageous! If I ever have a windfall, I expect to go into the hobby, but I'm on Social Security now, and it's out of the question. Meanwhile, I buy every issue of *MAN* at the newsstand: I can't afford \$25 for a subscription!

How about a comparative review of various types of planes (i.e., trainers, sports, gliders, patterns, etc.) like computer magazines do of software and hardware? This way, I could at least decide between kits, engines, motors, etc. Presently I'm torn between an Aero-Star 40 and a Sig Senior. Can you give me a comparison of them, as well as 4-stroke engines and 4-channel radios? From there, I can learn on my own.

MICHAEL P. GABRIEL
Cortaro, AZ

*Mike, I'm sorry, but I can't agree. Newcomers to R/C are always a consideration when the content of *MAN* is being planned. A look at our table of contents shows that! We regularly have Randy Randolph's "Basics" column, Joe Wagner's "Building Model Airplanes" and others, which (we hope) offer valuable information for those starting*

(Continued on page 12)

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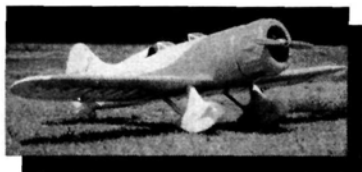
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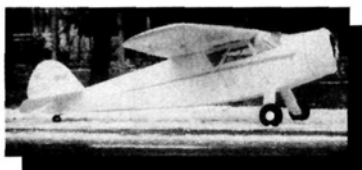
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AIRWAVES

We welcome your comments and suggestions. Letters should be addressed to "Airwaves," Model Airplane News, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

(Continued from page 11)

out. We even did a special issue on trainers to help beginners with selection. Obviously, we can't bias every issue toward beginners, but we make every effort to help them. Besides, everyone is a beginner when he or she enters a specialized segment of R/C like soaring, scale, helicopters and float flying.

Of your initial \$300 investment, at least half is for the radio system—a one-time buy. This very sophisticated piece of electronics requires very little upkeep, though, and it will last years if properly cared for; that in itself qualifies it as a bargain! Outrageous prices? I haven't been in a model train shop recently, but I recall some prices that would easily exceed the \$300 level you mention. All leisure activities could be considered expensive; it depends on your perspective and how much pleasure you derive from the hobby. I tell you what, Mike; we'll try to do better, and, as a famous singer once said, "My time is your time." Thanks.

RAU

PONDERING PLUGS

I'm 14 and have been flying R/C for about a year. I have a few questions about glow-plug idle bars. I have an O.S. 25 in my Aristo-Craft Cub, and I've used glow plugs with and without idle bars. (I ordered an O.S. no. 8 plug without an idle bar.) I can't seem to find a difference in performance between the two! What exactly does an idle bar do, and which is better?

JOSH KOPECKY
Grand Island, NE

Josh, the idle bar on a plug serves two purposes, both of which are related to heat retention. The bar protects the element from being extinguished by fuel when the rpm are reduced and the plug naturally cools; at the same time,

the bar is heated by combustion, and this enables it to function like a heavy-duty element, i.e., it sustains combustion by keeping the fuel/air mixture ignited. Idle-bar plugs are usually selected because they allow the engine to respond better to throttle changes. There are exceptions, however. Ducted-fan engines don't usually use an idle-bar plug, but have a selected heat-range plug that's optimized for the engine's operating band.

RAU

UPCOMING EVENTS CALENDAR?

Congratulations on a great improvement to your magazine—helicopters and scale! Living in the middle of nowhere, my problem is how to find out about scale meets or helicopter events (like the one in Merced, CA) before they happen, instead of reading about them afterwards! Writing to endless Chambers of Commerce has led nowhere. There's a wonderful Air Force Air Show south of Sacramento, CA, that I've never been able to find out about again! Could you offer a page of upcoming events?

DWAIN WRIGHT
Sisters, OR

Dwain, send a letter to the governing body for all aeromodeling activities in the U.S.—the Academy of Model Aeronautics, 1810 Samuel Morse Dr., Reston, VA 22090. They should be able to help you. If you plan to become active in the hobby, you should consider joining the organization.

RAU

FIFTY YEARS AGO

WINGED BATTLESHIPS AND PLANES THAT NEVER FLEW!

by BRENDA CASEY



The Short Sunderland—Britain's defense against the German navy.

ON THE COVER of *MAN* in July 1940 was the Short Sunderland patrol flying boat—a British “dreadnaught with wings.” Because its duties were anti-sub patrol and coastal defense, it had to be flexible, i.e., able to scout and fight. These diverse duties meant design ingenuity: to have terrific range, it had to store lots of fuel; to carry large loads, it needed a big wing and powerful engines; to fly fast, it had to be aerodynamic.

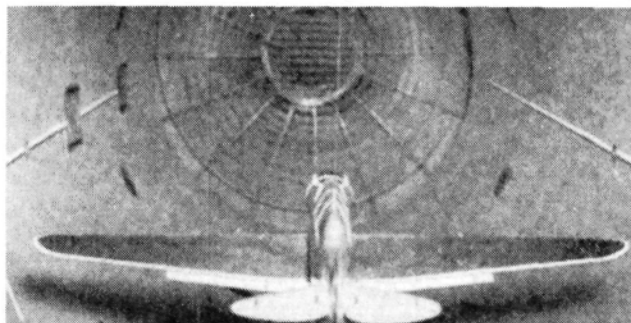
A descendent of the remarkable Short Empire-class flying boats, its hull's shape was very different; the rear step was much longer, and it had a knife-edge rear keel. This helped the giant bomber break loose from the water at takeoff. Another difference from its predecessors was the vast amount of equipment the Sunderland carried, including reconnaissance flare racks, beaching gear and landing cradles, bombs and even torpedoes. No other plane had

ever carried such an array!

Then the “epitome of military flying boat efficiency,” the Sunderland's maximum gross weight was nearly 25 tons! It wasn't sluggish, though; powered by four Bristol Pegasus XXII 9-cylinder, radial, air-cooled engines (each capable of 915hp at 6,250 feet), its top speed was 210mph, and its actual range was over 2,880 miles!

PLANES THAT NEVER FLY?!

Some planes did their part for the war and the advancement of aviation without ever flying! They had neither gasoline motors nor rubber-powered props—they were static wooden models used to test designs for full-scale aircraft! Back in 1940, the U.S. government spent thousands of dollars on models each year. One of its test sites—Wright Field in Dayton, OH (home of the army's \$20 million aeronautical research lab)—wasn't far from where Wilbur and Orville Wright tried out their early designs with models in crude wind tunnels!



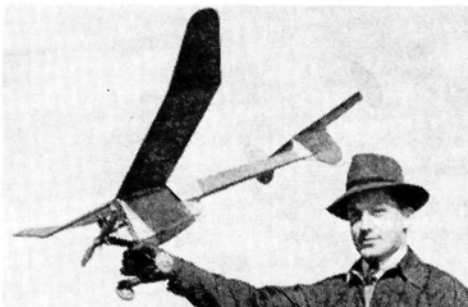
This model never flew, but, suspended in a wind tunnel, it provided valuable design information.

Built out of white pine or balsa by skilled craftsmen, the test-model fuselages ranged from 15 inches to 8 feet long, could take 150 hours to construct and cost between

\$200 and \$2,000! Full or partial models were specially made for performance, pressure distribution, drag, spin, flutter and free-flight tests, which were done in wind tunnels (in which the air is sucked out—not blown in—at 100mph!). By using models, engineers could fine-tune their designs (e.g., eliminate flutter and enhance the planes' weight-carrying capacity), and this reduced disasters in the sky with million-dollar full-scale planes.

SMALL-SCALE INGENUITY

Modelers, too, were busy designing, testing and revising back in 1940. “Gas Lines” featured the creative planes of readers, including



John Ogilvie and his flying Tadpole, which was just one of the unusual designs shown in MAN in July 1940.

John Ogilvie's original, fine-flying “Tadpole” and Orin Anderson's 13 footer, which had dual motors mounted in staggered positions, one above the other, in the nose. Martin Toggweiler made an unusual plane that weighed just 11½ ounces and had only a 36-inch wingspan. Its fuselage was merely a cone of balsa flattened at the rear, so construction was simple. Allyn Hoopengartner experimented successfully with the difficult gull wing to create a contest-winning bird, and even folks in far-off Siam were overcoming obstacles (e.g., a lack of local materials) to create up to 15-foot fliers!

Brig. General George H. Brett was right when he said that the planes of tomorrow would “change our daily time schedules and the style of our clothes” by bringing nations closer together. As they've gone from blueprint to model, model to mock-up and on to “the real thing,” planes have increased our travel options, advanced our knowledge of aviation, awed and entertained us. ■

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING!

SEND IN YOUR SNAPSHOT\$!

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of 1990. The winner will be chosen from all entries published, so get a photo or two together plus a brief description and send it in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

MAGNIFICENT MONOCOUE

A. Lynn Lockrow (Auburn, AL) says $\frac{1}{4}$ scale is his main area of interest, and he loves monocoques. He started with an Ikon N'West kit, then covered it with white Permagloss Coverite accented with Presto trim. An S.T. 3000, swinging an 18x6-14 prop, hauls the 16 $\frac{1}{4}$ -pound beauty in a scale-like fashion using only half throttle! Beautiful job, don't you think?



KAPABLE KUSTOM KOUGAR

Obviously preferring his performance in double doses, Dan Yarchin (Leesburg, VA) produced this twin Kougar by starting with the standard Sig kit and duplicating the fuselage. A 20-inch-wide center wing panel connects the two fuselages, and the stock panels are used outboard. It's 9 $\frac{3}{4}$ pounds of fire-breather with two O.S. .40s hauling it around. Dan used MonoKote and K&B SuperPox for the finish.

3-POUND STERLING (COLT)

Gary Owens (Sierra Vista, AZ) apparently believes in testing manufacturers' claims. He took a Sterling Tri-Pacer kit and modified it to the Piper Colt configuration. He says that the kit's instructions said it "could be fitted with R/C," so he tried it and succeeded. Gary's Colt spans 58 inches, it's covered with Coverite and uses a Saito .45 4-stroke for power. All-up weight? Under 3 pounds!



LOVELY LUSCOMBE

A very pretty—but infrequently modeled—subject, the Luscombe 8E apparently captured the heart of John Lane (Northville, MI). John enlarged "a very old set of Cleveland plans" to produce the 86-inch, 12-pound beauty. It's covered with MonoKote, and its color scheme was copied from a full-scale 8E near John's home. An O.S. 120 4-stroker provides the power. Any plans available, John?





TWO WINGS DOUBLE THE FUN

D.W. Merrill (Preston, ID) has only been building for three years, yet this Ace 4-120 biplane is the fourteenth model he's built! It uses an O.S. 120 4-stroke for power and is covered with MonoKote. Doesn't that transparent blue show off the structure beautifully? Its pilot, Cap'n Eddie, sure looks pleased! D.W. says it flies "sweet" and that he loves building as much as flying.

BYRON'S BASIC SPORT JET

This nicely finished Byron MiG-15 is the work of Tony Iannucelli (Portsmouth, RI). It uses the Byrojet fan unit driven by an O.S. .77 fan engine. Tony chose Chevron Perfect camouflage paints for the color and a Futaba PCM for guidance. He kept the weight to a trim 9½ pounds by leaving out options like flaps and retracts—allowing him to use his MiG as a true sport flier.



A PAIR OF HORNETS

Jon Bailey and Greg Mix (Boulder, CO) decided they liked the looks of our Sport Hornet (plan no. 4891), so they built this sharp-looking duo. Both were originally powered by O.S. .25s, but they've been given new engines—Jon chose a K&B .40 for his, while Greg opted for an S.T. .29. With these two guys, the need for speed is evident!



SUPER SCALE SUKHOI

What's 1/5 scale, YS-120 powered, weighs 14 pounds and is only the *second* airplane Dee McNeill (Stevensville, MI) has built?—this gorgeous Su-26M, that's what! It was built from the Zimpro Marketing kit and spans 68 inches. If the Soviet team flying the full-scale Sukhoi spot Dee's color scheme, I just bet they'll think about painting theirs to duplicate the model.

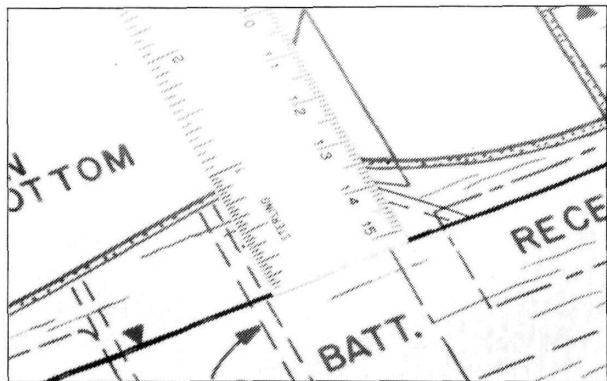


HOW TO:

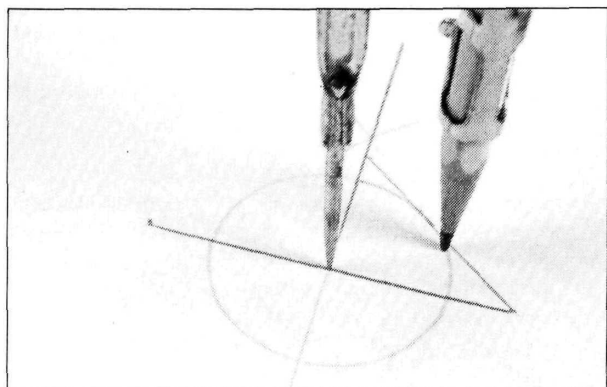
by RANDY RANDOLPH

DRAW AN ELLIPSE

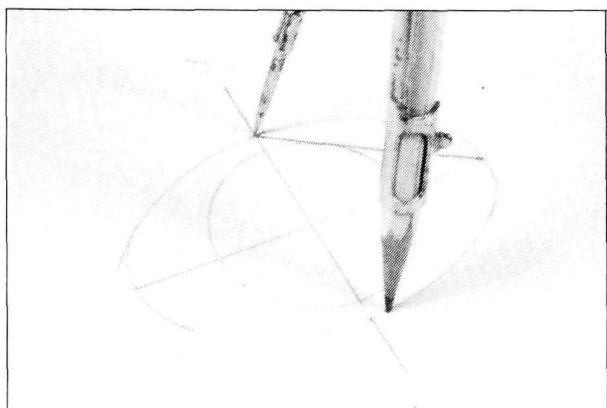
Elliptical wings are beautiful, but the shape is most commonly seen in cabin and cowling formers. The photos show an easy way to draw an ellipse.



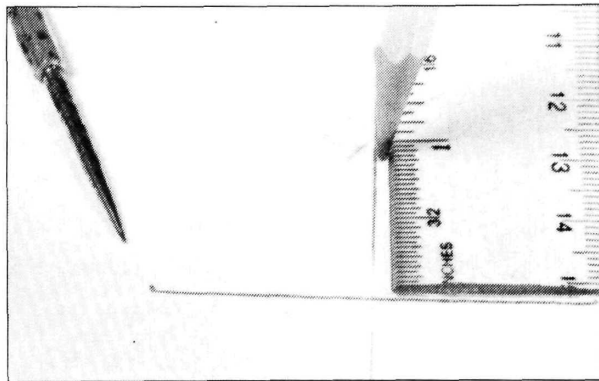
1. You'll need a ruler, a compass and a pencil. First, measure the height and width of the former you want to make.



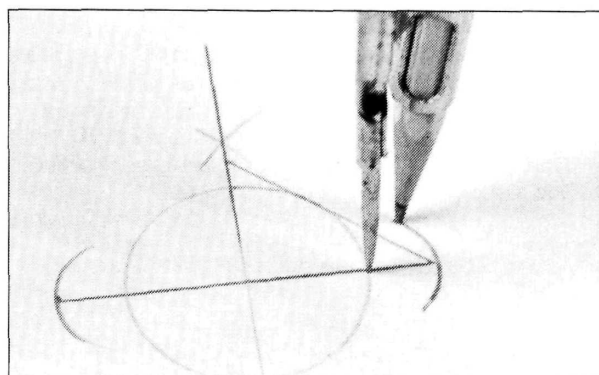
3. Draw a diagonal from the height measurement point to the width point; then draw a circle with a radius that equals the distance from the center mark to the center of the diagonal line.



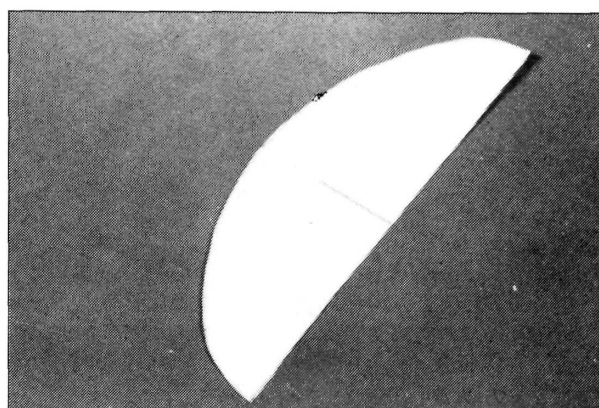
5. Finally, draw an arc with a radius that equals the distance from the two height marks on the vertical, or height line. The ellipse is now complete.



2. Draw a line that's as long as the width of the desired former, and use the compass to bisect that line. Mark the bisected line at a distance equal to the height of the former above and below the width line.



4. Draw arcs from the intersection of the central circle to the ends of the width line. You don't have to draw complete circles.

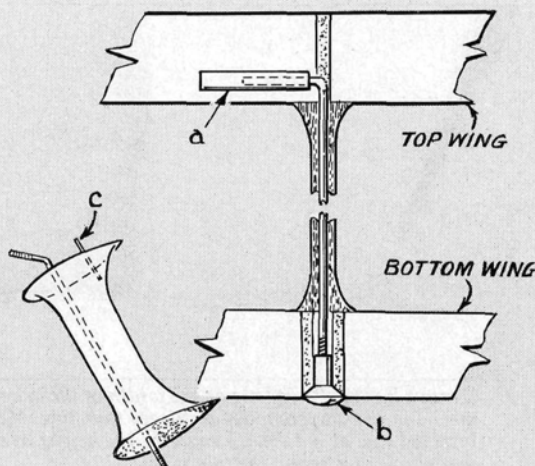


6. Either the top or bottom half of the ellipse is the template for your former. This method doesn't produce a perfect ellipse, but it's close enough for most model work.

HINTS & KINKS

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH. PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

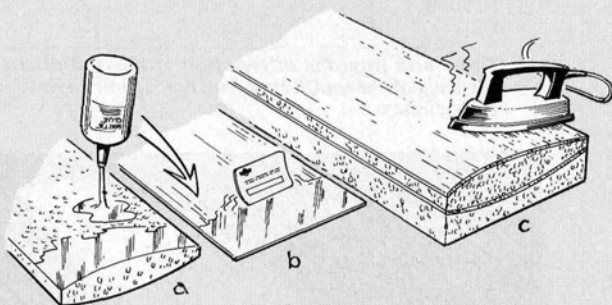
by JIM NEWMAN



INTERPLANE STRUT ATTACHMENT

This method actually pulls struts into compression just like on a real biplane. Bend a bicycle spoke 90 degrees at one end and slip it into a nylon tube (a) that's fixed to the top spar. The spoke is faired with balsa and given a broad base at each end so that tightening the spoke nut (b) pulls the two wings together tightly. Note: the struts should sit on a pair of strongly reinforced ribs, and a small pin or dowel (c) keeps them aligned fore and aft.

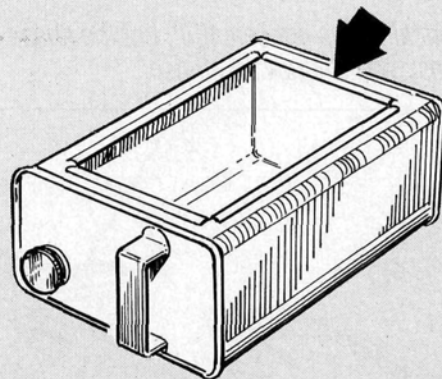
Fred Schmidt, Livonia, MI



HEAT-SEALING BALSA

Did you know that balsa can be applied just like covering film? Spread a thin layer of white glue over the balsa and the foam core, and allow it to dry. (An old credit card makes a great glue spreader.) Then, place the balsa sheet on the core and slowly move a hot iron across it. The heat will polymerize the glue and bond the balsa firmly into place. Take care not to overheat any one spot, as this will raise blisters in the foam.

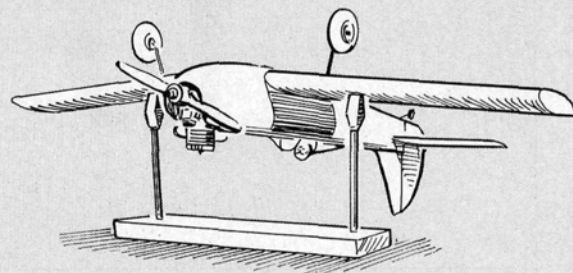
Tony Stinson, Brookvale, NSW, Australia



PARTS-CLEANING PAN

Put an empty fuel can to good use as a parts-cleaning pan! Cut an opening in one of the broad sides and turn back the edges, or slip fuel line over them (arrowed) to guard against cuts. Our contributor uses a piece of brass tube and some pinched-off fuel line in the cap as a drain, but he suggests that you can just as easily remove the cap and tilt the pan to empty it. I recommend that you use a piece of screen wire on blocks laid in the bottom. This allows the sediment—but not the parts!—to fall through.

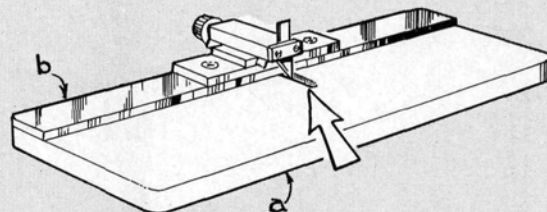
Frank Prevec, Warren, OH



BALANCING LOW-WING PLANES

It's much easier to balance a low-wing plane by setting it inverted on an eraser-tipped balancing jig. If you try this with the model upright, it will fall over!

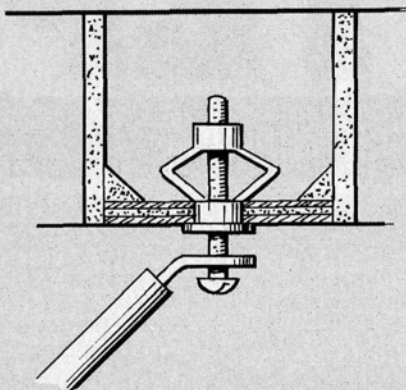
John Jowell, Dumas, TX



BALSA-STRIPPER MODIFICATION

This simple alteration makes a Master Airscrew balsa stripper much more convenient and accurate. Make the base (a) and edge guide (b) from Masonite or Plexiglas; then bond or screw the stripper to it as shown. Note that the tip of the knife blade fits into the groove (arrowed) that's routed into the base.

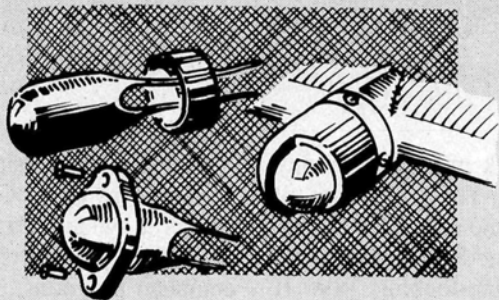
Jay Wallace, Ashland, OR



STRUT-ATTACHMENT FIELD REPAIR

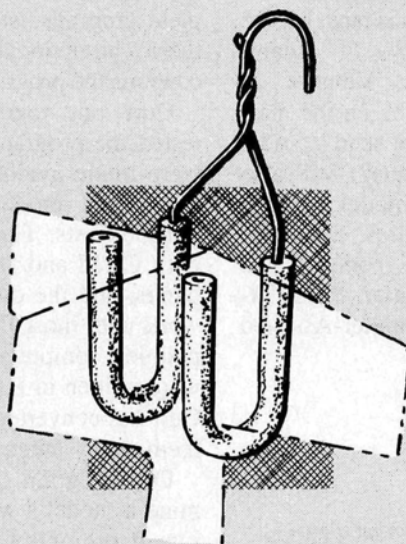
When a nut plate fell out of his large-scale model, our contributor drilled out the strut-attachment plate and inserted a wall anchor nut. Refitting the strut and tightening the screw made the nut expand inside the wing, so the fixture is now permanent.

Jerry Hermanek, Phoenix, AZ



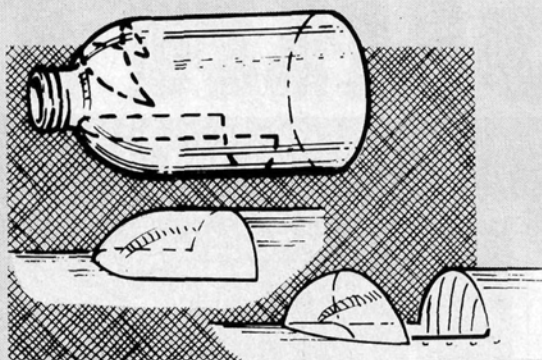
NAVIGATION LIGHTS

Nav lights aren't as simple as they look—study the variety at your airport!—but these are the most convincing navigation lights for scale models! Radio Shack sells cheap bags of light-emitting diodes (LEDs), which come in red, green and pale amber, and you can make the fittings out of pieces of tube, plastic sheet or Epoxolite.



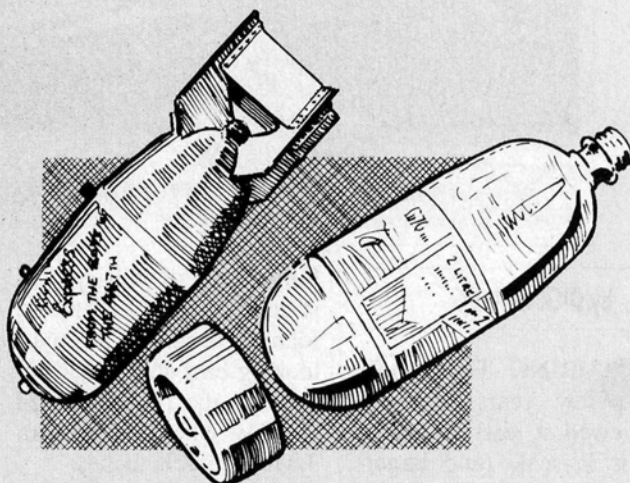
MODEL HANGERS

Hang up those models! Bend a wire coat hanger to hook around your plane's stabilizer (close to fuselage). Use rubber tubing from the auto department to protect the leading edge.



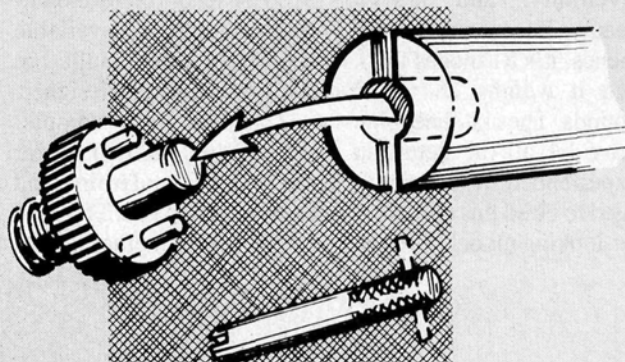
HANDY RECYCLABLES

Clear plastic bottles are a great source of molded canopies and windshields. For bigger planes, use bigger bottles!



1/4-SCALE BOMBS

Remove the base and neck from 2-liter plastic bottles, add fins of thin plastic sheet, and paint on bands of olive drab and yellow. You now have light, 1/4-scale bombs for your 1/4-scale P-51 or P-47!



ENGINE-ADJUSTMENT KEY

Perry carburetor needle valves don't take kindly to extensions that vibrate and alter settings. Drill two holes, then solder in 1/32-inch-diameter wire pins. Drill and slot the end of an aluminum rod to make an adjustment key for use with cowed engines. The key can be knurled or have a T-bar.

GIANT STEPS

The Sea Fury and the Art of Plans-Building



Superb Stearman Skybolt from Dario Brisighella plan. Built by the Dario himself, it establishes his credibility both as a designer and as a builder. He has a model in the EAA Museum at Oshkosh.

PHOTOS BY DICK PHILLIPS

by DICK PHILLIPS

DURING THE PAST few years, I've reviewed at least 200 plans for 1/5-scale (and larger) models so that I can include them in my books, and more arrive weekly. I recently received one for the Hawker Sea Fury from Roy Vaillancourt of Vailly Aviation*, and it's a beauty. Its wingspan is 90 inches, it's 81 inches long, and it weighs 28 to 32 pounds. The six-sheet plan provides all the detail an experienced modeler will need to build this spectacular-looking model. The Sea

Fury has an all built-up construction (and lots of it!); no foam is used. It's a great-looking bird and should fly well on the recommended engines, which range from 3.4 to 4.2 cubic inches.

There's also a package of goodies: canopy, cowling, spinner and backplate, plastic display spinner and construction photo pack are included with the plan—all for \$100. A set of (rather expensive) retracts is available separately, and details are available from the designer.

The Sea Fury complements Roy's earlier plans for the P-47 Thunderbird and Hawker Hurricane. The P-47 can be built in either the ra-

zor-back or bubble-canopy version. These plans are all well-done and allow experienced model builders to produce fine-looking WW II heavy iron. They aren't for beginners to plans-building, and all three require some skill to fly.

NEW BOOKS

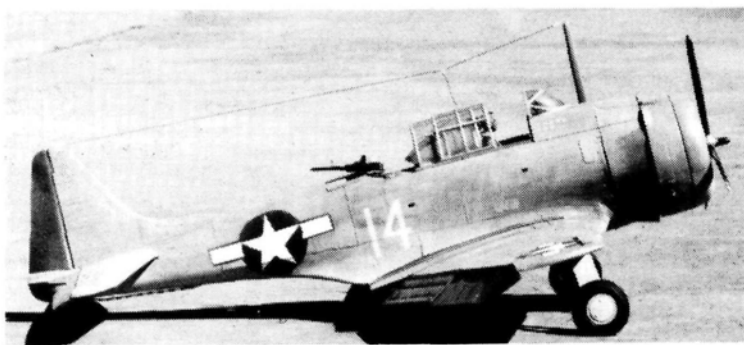
For you plans fans, ViP's* "Directory of Giant-Scale Plans, Volume 2" should now be on the market. (Why not send a SASE for a catalogue?) ViP also produces a model airplane book that will be especially interesting to modelers who use a computer. "CAMA-DAT (Computer-Assisted

Model Airplane Design and Testing)," by Curtis Givens, covers a wide variety of model-airplane-oriented computer programs, including one designed to calculate Wakefield rubber values and another that can determine a model's terminal velocity. The use of these programs is explained; there are complete program listings; and there's an optional disc that contains the programs.

Curt put together and tested the programs, which were made available by a number of modelers/computer experts. They run on both CP/M and DOS computers, and the disc should work with most DOS-compatible computers. Most were written in BASIC, but Curt has converted some of them to "C" language.

One program can determine a model's wing loading. It prompts for the required information, makes all the calculations and provides choices for a number of wings and wing plan-

(Continued on page 24)



Another plans-built model, this SBD-5 from Herb Hall's D.P. Systems plan is difficult to tell from the full-scale airplane.

GIANT STEPS

(Continued from page 22)

forms. Another prints out the ordinates for specified airfoils when provided with the chord. Several airfoils are included, and information for adding others is provided.

PLANS-BUILDING

"Plans-building" is often regarded as synonymous with "scratch-building," but building from plans isn't true scratch-building. (Scratch-building implies that the builder creates his own plan, then builds from it.) There are several advantages to plans-building, not least of which is that plans are available for many models that aren't available in kit form. I know there are well over 200 giant-scale plans, so there should be *something* for even the most jaded builder. There are plans for models that would be prohibitively expensive to kit, and this makes it possible for us to build these super models.

SUBSTITUTE MATERIALS

Building a large model from plans can be much less expensive than building it from a kit—especially if you're willing to use substitute materials, as I do. I cut much of my stick stock and often find good-quality soft-



Dennis Bryant's SE-5 from his own plan. Dennis is another designer whose work epitomizes the best in design and construction.

wood in building-supply yards. An 8-foot length of 2x4 makes a large pile of 1/4-inch-square building stock; you just need a good table or a radial-arm saw.

Using a hollow-ground planer blade on my radial-arm saw, I cut Sitka spruce into pieces as small as 1/8 inch square. Be particularly careful when cutting the smaller pieces because Sitka spruce is fairly brittle and having the saw kick back could be disastrous. A table saw would be better, but a well-aligned radial arm will do the job when carefully operated.

SOURCES

Companies that sell full-scale, home-built airplane supplies are often excellent sources for plans-builders. They stock excellent Sitka spruce boards, which are relatively inexpensive in the quantities we use. (You may sometimes be

able to buy reasonably priced material that isn't good enough for full-size airplanes.)

There are so many types of good plywood available that no modeler need be short of good building material. I live where boat building is common, and the "offcuts" (waste pieces of wood) are ideal for modeling—and it's often available for the taking. Most marine-grade plywoods use waterproof glues and don't have voids (holes resulting from blemishes or knots falling out). Other industries that use plywood are good candidates for this "scrounging" maneuver! Use a little ingenuity.

Over the years, I've found literally hundreds of items that lend themselves to plans-building. Most are much less expensive than a comparable hobby item, and they're often more readily available.

COVERING WITH A SLEEVE

Icover my models with inexpensive, glider-grade Ceconite, which can be bought by the yard from home-builder supply houses. A square yard weighs approximately 3 ounces and is usually enough to cover a large fuselage. It's easy to

sew and is a superb covering. It works best with open-frame structures, but also gives excellent results over sheeted surfaces.

I take a series of measurements along the center line of the fuselage I intend to cover. The measurements mark the locations of the formers, and I transfer them to a center line that's drawn on the cloth to be used. I then measure the fuselage circumference, and I mark these measurements out at right angles to the center line on the cloth. (To provide enough for sewing, I add 1/4 to 1/2 inch.)

When the required cloth shape has been established, I cut it out and make a sleeve that fits the fuselage. The seam goes on the bottom (as it does on full-scale planes).

When the sleeve is ready, I coat the fuselage liberally with about three coats heat-sensitive adhesive (e.g., Balsarite). The material dries quickly, so this isn't a lengthy procedure. When the fuselage is ready, I pull the sleeve tightly over it. Rather than use a hot iron (which would shrink the material before I'm ready), I brush acetone onto the cloth, then rub it in to activate the adhesive underneath. At first, I seal the material *only* to the

(Continued on page 74)



Designer Len Bosman designed and built this 1/5-scale Waco YMF-3. Model is very stable and looks realistic in the air. (I don't think any of these models are available in kit form in these sizes.)

A high-flying artist whose work
graced nearly 400 issues!



JO KOTULA

by RICK DeMEIS

MODEL
AIRPLANE
NEWS'
KING OF
THE COVERS





This two-page spread shows the Lockheed F-94 (left) and the Northrop T-38 Talon. Right inset: January 1936 MAN cover showing the Wedell Williams Racer.





the P-1 Hawk painted as if in a small photo "clipped" to the paper.)

A STRUGGLING ARTIST

When Jo left Pennsylvania at 16, his career as an artist began. In his travels, he met the pioneers of aviation and, with his natural talent, he was able to portray the advances in aviation as they

unfolded. Sixty-five years ago, he was working his way through the Midwest: "There were no great opportunities to do aviation work, but I sought out all I could. I found myself going out to the local airport whenever possible, and I continued sketching. Back in the agency studio, in my spare time, I'd even do aviation work that wasn't commis-

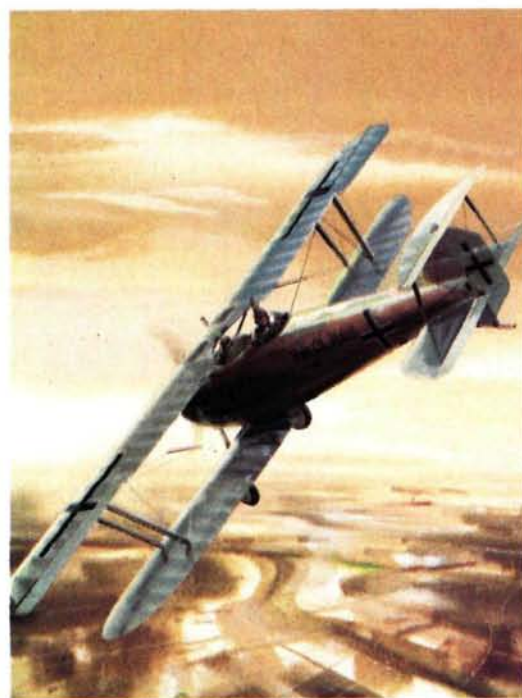
sioned, just for the love of it. Later, in San Antonio, I studied the aviation pulp magazines, but out there, I couldn't hope to secure work with them."

In 1931, Jo went to New York and started working for the pulps. "I began doing inside illustrations, story headings and even lettering. Advertising work, however, was slow because of the Depression. Back then, illustrations were simple drawings to fit modest ad budgets."

THE BIG BREAK

It's hard to figure my big break with *Model Airplane News*. I had only done a few things

they might have seen, including a black-and-white Sopwith Camel raid on a German aerodrome in a higher-caliber pulp for which I was paid \$7. Along with other accounts, I found *Model Airplane News*, and I was asked to do a cover." Jo's September '32 cover



GENERATIONS OF modelers know Jo Kotula's paintings. From 1932 to 1970, nearly 400 of them appeared on the covers of *Model Airplane News*. Jo was one of the most sought-after advertising artists, particularly in the aviation industry.

BIPLANE MEMORIES

Jo remembers seeing some of the early planes in his home state of Pennsylvania: "I'd make my way to the nearest airport. Two or three Jennys operated out of Latrobe and, of course, just to see a biplane at that time was a big thing. Occasionally, we'd see a real veteran flier, like Casey Jones with a Curtiss biplane racer, which was more streamlined than the 'suarish' biplanes of the time. Later, I managed to get to Pittsburgh and saw those beautiful Curtiss Hawks—fighters with big D-12 in-line engines. What good-looking airplanes! I even used it on the cover I did for *MAN*'s 50th anniversary to indicate the span of time." (That cover featured an F-16 with



July 1932
Hawker Fury



June 1940
Curtiss X503C-1



March 1950
A modeler works on his...

led to work for Curtiss-Wright, Brewster, Piper, Sperry and others.

"In my years with *Model Airplane News*, all we had was an verbal agreement. I consider that unique. I suppose they thought that there was some worth in sticking with one artist! They were content with my research and studies of each plane we selected. I was given a choice of subjects in almost every instance."

Jo's first *MAN* paintings "tended to be WW I biplane fighters and, occasionally, a few monoplanes; after all, the war had ended only 15 years before. Editor Charlie Grant and I selected certain aircraft that were in vogue and some experimental types. We had our choice of so many that the whole scene broadened out! I did a few in oil, but I went back to

watercolor and stayed in transparent watercolor for quite some time."

In the mid-'50s, Jo started to use opaque watercolors, and these added a more "solid feel" to his aircraft. One of the first major works he did using both types of watercolors was a series of

cloud illustrations for an Air Force weather manual.

FAVORITES

My favorite *MAN* covers were those of the WW I Sopwith Pup and the German Albatros, and I'll probably never do better than the rendering of the CF-100.



September 1964
Lockheed SR-71 Blackbird
(Kotula's impression)



February 1962
Republic P-47D Thunderbolt

ant Stunt Model; Radio Control; Foreign Notes



April 1956
Convair TF-102

1956 NATIONALS STORY-Radio-Controlled Submarine



November 1956
Lockheed F-104 Starfighter

MINOR MEET Stunt Winner - Flying Model B-66 Bomber!



April 1957
Chance Vought Regulus

Wing Flapper, Flying Model Ornithopter - Scale Corsair



May 1957
Great Lakes Trainer

Other favorites were the British F.E.2b and 2d done for the March '64 cover. I favored WW I aircraft, since I grew up just after it happened, but it's just as easy to render a fast airplane as a slow one." (Noted aviation artist Keith Ferris produced the preliminary pencil

sketches for several of Jo's covers.)

Jo remembers the simple format for *MAN*'s cover: "You just composed to your own taste and made allowances for the logo. The airplane's name could be inserted anywhere. Then they began to insert captions for

various articles, making a mess of some covers, but it wasn't too bad. Part of the composition was dictated by the references we had at the time, which weren't always the most accurate. For instance, I'd look for photos that weren't seriously distorted and eliminate those taken just off the wing tip. Then I'd take my sketch from the photo, or from a perspective-corrected drawing, and pencil that down. Often in doing fabric-covered airplanes, washing the airplane in over the background gives a realistic effect of translucent, colored fabric."

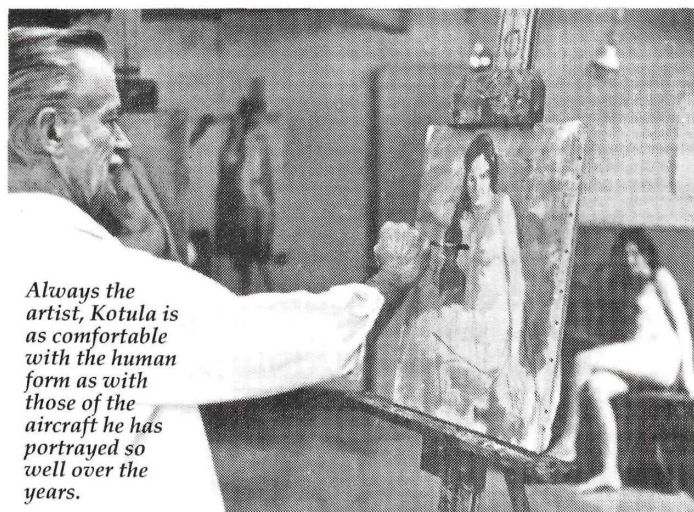
PRINTER'S PREROGATIVE?

The printers occasionally made some unwelcome changes to the cover paint-

ings: "Sometimes, the engravers got preoccupied with emphasizing details, such as wires, and they ended up making changes. They thought they were doing us favors by showing the wires as solid lines, rather than dropping them into the background as we wanted! This happened with the F.E.2b painting I mentioned earlier."

In the early days, Jo was encouraged to use dramatic "speed lines" streaming back from a plane: "I'm surprised I haven't received more criticism for that! You don't see them much anymore."

Now in his 80s, Jo lives in New Jersey, and his studio is filled with his artwork. He's quick with an aviation story or an explanation of the finer points of art, and he's still painting. ■



Always the artist, Kotula is as comfortable with the human form as with those of the aircraft he has portrayed so well over the years.

Those Magnificent Men in Their Flying Machines

ARTIST JO KOTULA tells some great stories: "In 1933, I flew out to the Cleveland air races in a Taylorcraft. General Balbo flew by with his armada of Italian S-55 flying boats—all the gunners stood at attention in their open-air turrets and gave the Fascist salute! I remember the racehorse starts when the planes lined up abreast and took off. This was the era before tight discipline was imposed on small plane designers, and one young fellow pressed a turn too hard and came spinning down. It was well out of our sight, but I knew a fatality had occurred from what the announcer had described. It was one of those sad moments that stays in your mind.

"A memorable event happened in 1925, back in Pennsylvania. Some friends and I were on a hill near our house when we heard the sound of airplane engines. It wasn't the sound of the slow, cumbersome Jennys we sometimes saw—it was a round, more substantial throb. We saw a formation of three Curtiss P-6E Hawks come right over our heads. With that underslung radiator, each profile looked rakish and aggressive—like a masked knight. It was tempered somewhat by those beautiful tapered wings. That was quite a thrill, since they flew over twice as fast as the Jennys, which did all of 60mph!"

LINDY FLIES BY

After his transatlantic flight, Charles Lindbergh made his cross-country tour in the Spirit of St. Louis. Jo was in Tulsa, OK, at the time: "At the time, there were almost no navigational aids, so

when Lindbergh came out from a low cloud bank over the field, we knew that he was the navigator!

"In San Antonio, I saw the old Breguet biplane in which Costes and Bellonte crossed the Atlantic in the opposite direction—east to west. On that big Breguet, the engine was started by pulling a rubber shock cord attached with a cap over the prop tip. It seems so primitive now!

"Again in Tulsa, out at a racetrack, I saw a pilot bring a Jenny over the track, loop it, and come out of it close to the ground. We understood so little that we took this for granted. Today, we'd be shocked at anyone who would dare do a thing like that. Shorty Schroeder slipped over the side of a Jenny with a parachute packed in a canvas bag that hung below the plane—really crude and primitive. He left the Jenny at about 250 feet, and it couldn't have been more than 5 seconds before his feet hit the ground. We've seen flying like that in 'The Great Waldo Pepper,' but these memories still seem out of the ordinary."

When the Ford Reliability Tour came through Oklahoma, Jo says: "I got my first look at a Ford Tri-motor. I also saw Eddie Stinson with his monoplane and other planes that were based on the new Wright Whirlwind motor, which enabled Lindbergh to make it. In Tulsa, I had an hour of dual instruction in a Jenny for \$25, and I was only earning \$20 a week! The ship was very logy, and it answered the controls sluggishly."

Jo has lived through aviation's pioneer days and the Golden Age of the '30s. His stories are as interesting as his paintings. ■

ENGINE EVALUATION

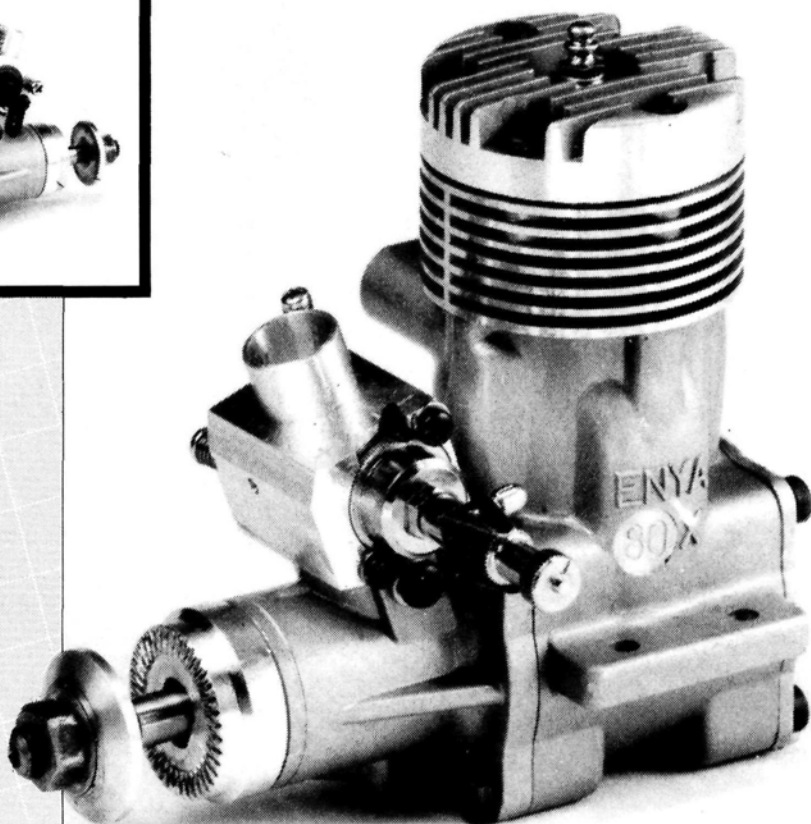
XF
.80
ENYA



**Punch out a
.60, fine-tune
the details,
and you've
gained power
without
weight**

by MIKE BILLINTON

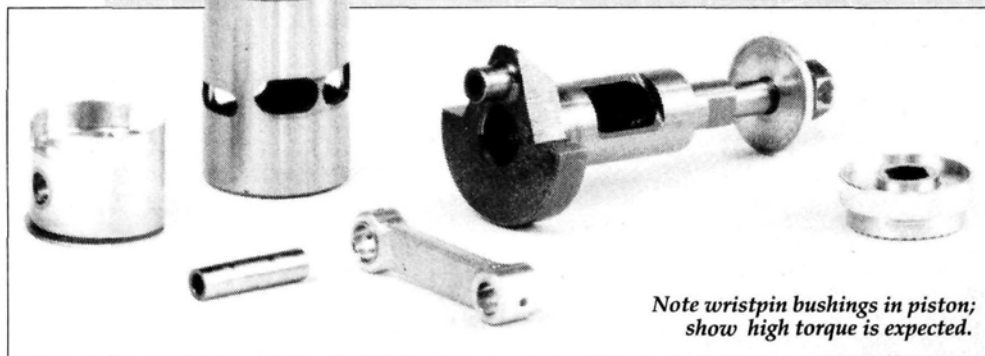
The standard .60 XF case accommodates the new .80 bore, which is .120 inch larger than the .60 XF.



THE ADVANTAGES OF increasing cylinder capacity in an existing successful engine size continue to appeal to model engine manufacturers. I've already reviewed three such engines: the Irvine 46 (increased from the well-known .40-cubic-inch); the OPS 80 fan engine (based on the .65 unit); and the Saito 80 4-stroke (built on the .65).

This month, I discuss an increase in bore in the already successful Enya* .60 XF. With the new .80 XF, the actual increase in cylinder capacity is 26 percent, and the stroke/bore ratio is among the lowest at .808:1.

Boring out an existing engine usually results in a weight increase, a reduction in maximum rpm and, consequently, a relative loss in horsepower. In the Enya .80 XF, it's increased by only 13 per-



*Note wristpin bushings in piston;
show high torque is expected.*

PHOTOS BY MIKE BILLINTON

Widened-groove spray bar on right is common to both this .80 sport engine and the Enya .60 X heli engine. On left: the .60 X "fixed-wing" engine's spray bar. Black "tags" can be rotated for mid-range adjustment.



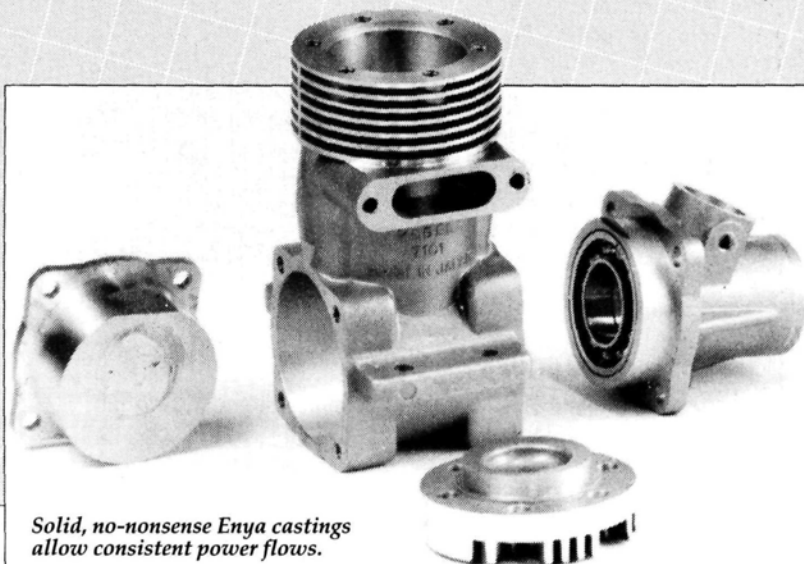
cent, and torque levels are much less harmed, with this engine producing an increase of 24 percent. Even more significant is the torque/weight ratio, and this new, "oversize" engine can conveniently fit existing craft because its overall mounting dimensions, etc., are the same.

The torque/weight ratio table shows results from a variety of engines (open-exhaust figures). Note that the "capacity-increased" .80 XF engine rates high:

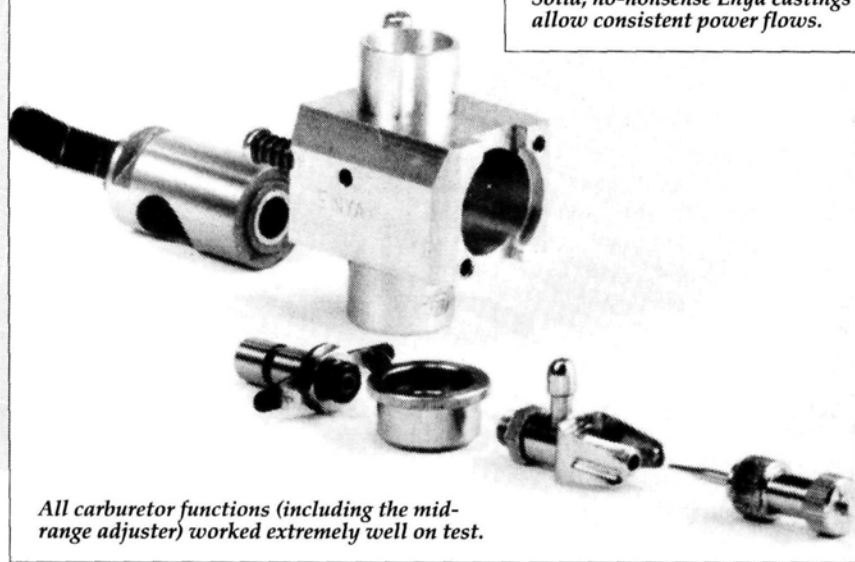
| Torque/Weight Ratio | Units are oz. inch/lb. |
|------------------------------|------------------------|
| Super Tigre 60cc twin | 143 |
| Enya .80 XF* | 142 |
| OPS .80 Fan* | 134 |
| Super Tartan 44cc twin | 125 |
| Irvine 46* | 124 |
| Saito 80 4-stroke* | 122 |
| OPS 60cc twin | 121 |
| YS 120 4-stroke | 114 |
| ASP 61 | 108 |
| Enya R120 4-stroke | 108 |
| Enya .60 XF | 105 |
| Irvine 40 | 102 |
| Saito 65 4-stroke | 100 |
| Enya V-twin 40cc | 99 |
| Super Tartan 20cc | 95 |
| Super Tigre 2000 | 91 |
| Nova-Rossi 3.5cc | 86 |
| Kawasaki TA51cc | 82 |

*denotes capacity-increased engine

Although Enya's new engine is designated an "80," it actually measures .764 cubic inch. Existing cylinder-head bolt holes in the crankcase limit the degree to which the case can be bored. Here, even with the thinner steel liner wall than Enya's usual aluminum-alloy one, mechanically, this capacity of .764 cubic inch was as far as Enya wished to go without resorting to the more elaborate exercise that an increase of stroke would require.



Solid, no-nonsense Enya castings allow consistent power flows.



All carburetor functions (including the mid-range adjuster) worked extremely well on test.

Focusing on the torque increase, Enya persuades us of the merits of large propellers and low rpm by providing the .80 XF with a significantly reduced effective compression ratio of 6.5:1. This allows detonation-free performance at rpm levels that are low enough to cause problems for the more usual higher-revving 2-strokes. Enya's recommended propeller sizes indicate this (diameters from 12 to 14 inches and pitches from 8 to 12 inches).

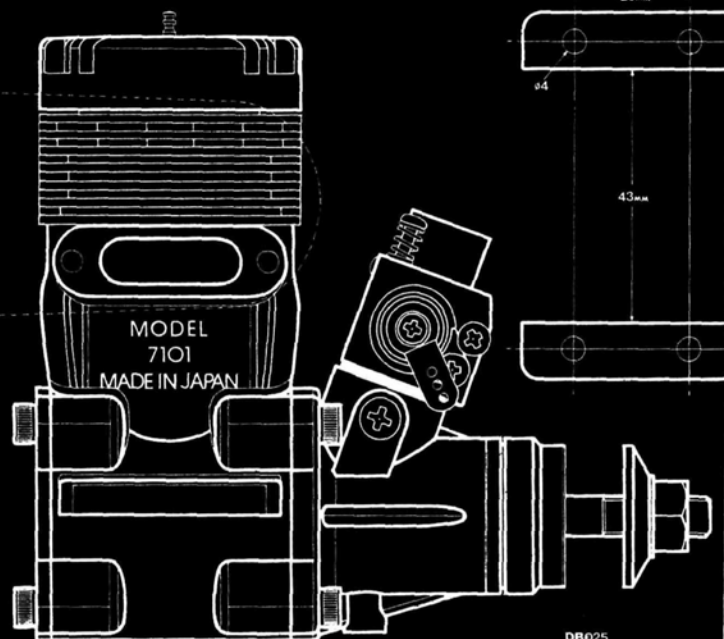
80XF

SPECIFICATIONS

50% OF FULL SIZE

| | |
|-------------------|---|
| Capacity | 7639 cubic inch (12.518cc) |
| Bore | 1.0635 inches (27.02mm) |
| Stroke | .860 inch (21.84mm) |
| Stroke/Bore ratio | 808:1 |
| Timing Periods | Exhaust: 160° Transfer: 114° (angled up 5°) Boost: 116° (angled up 50°) Front Induction: Opens: 40° ABDC Closes: 54° ATDC Total Period: 194° Blowdown: 23° |

| | |
|----------------------------|--|
| Combustion volume | 1.53cc |
| Compression ratios | Geometric: 9.18:1 Effective: 6.47:1 |
| Exhaust-port height | .285 inch (7.23mm) |
| Cylinder-head squish | .031 inch (.78mm) |
| Cylinder-head squish angle | 10° |
| Squish-band width | .177 inch (4.5mm) |
| Carburetor bore | .398 inch (10.1mm) |
| Crankshaft diameter | .669 inch (17mm) |
| Crankshaft bore | .433 inch (11.02mm) |
| Crankshaft nose thread | 7x1mm |



| | |
|-------------------------------|----------------------|
| Crankpin diameter | .275 inch (7mm) |
| Wristpin diameter | .250 inch (6.36mm) |
| Connecting-rod centers | .41mm |
| Engine height | 4 inches (101.6mm) |
| Width | 2.44 inches (62mm) |
| Length | 3.55 inches (90.2mm) |
| Width between bearers | 1.71 inches (43.4mm) |
| Mounting-hole dimensions | 20x52x4mm holes |
| Exhaust-manifold bolt spacing | 34x4mm bolt size |
| Frontal area | 7.53 square inches |
| Weight (bare) | 19 ounces (540gm) |
| Crankshaft weight | 3.45 ounces (98gm) |
| Piston weight | .55 ounce (16gm) |

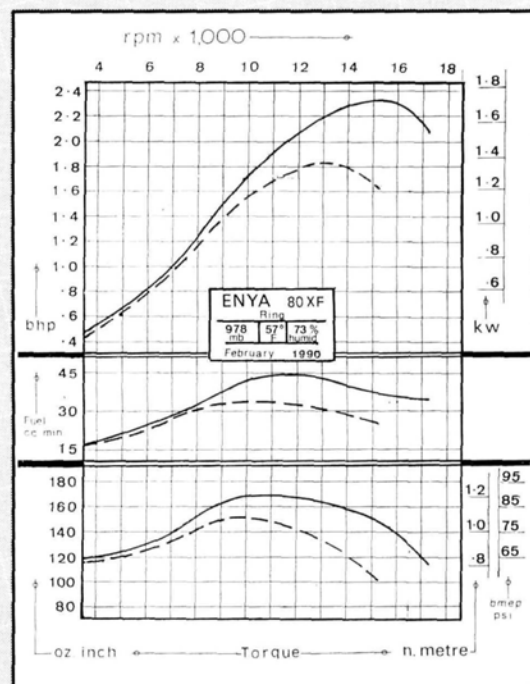
MECHANICAL DETAILS

In all respects, the Enya .80 XF follows accepted, Schnuerle-ported, 2-stroke model engine techniques.

The aluminum-alloy crankcase has side exhaust, two side transfers and one boost passage. The front housing and rear cover can both be separated from the case. The thin-steel liner is ground to size internally and then "push-fit" into the case. Its large blow-down period—23 degrees—results from the 160-degree exhaust timing and 114-degree transfers (as measured from the top of the piston ring).

The high-duty, high-expansion, aluminum-alloy piston is machined from a solid and is fitted with a cast-iron ring that's pegged to prevent rotation into the large ports. The piston crown is .006 inch less than bore size, and the skirt is .003 inch less. In piston construction, the provision of phosphor-bronze bushes at the wristpin position is unusual, and it shows that Enya recognizes the new—higher—stresses anticipated within the existing engine structure. The piston weight is now .55 ounce compared with the .3 ounce of the .60 XF.

The connecting rod is the same as that in the .60 XF unit. Both its small and large ends are bushed and have three lubrication holes. The cylinder-head combustion-chamber layout is slightly different because of the increase in bore size, and also because the squish angle is now 10 degrees instead of the 0 degrees of the .60 XF engine. The volume of the .60's combustion chamber was .98 cc; the new .80's is 1.53 cc. The crank-



Performance:

| | | |
|--------------------------|------------------------------------|--------------------------|
| Max. BHP | 2.31 at 15,722rpm | (Open exhaust/10% nitro) |
| | 1.84 at 13,294rpm | (Enya muffler/10% nitro) |
| Max. Torque | 169 ounce/inches at 10,880rpm | (Open exhaust) |
| | 152 ounce/inches at 9,839rpm | (Muffler) |

| RPM on standard propellers: | Open Exhaust | Enya Muffler |
|------------------------------------|---------------------|---------------------|
| 18x8 Top Flite | 5,206 | 5,094 |
| 16x6 Airflow | 8,098 | 7,421 |
| 15x8 Graupner | 7,983 | 7,443 |
| 13x10.5 MK glass | 9,108 | 8,340 |
| 14x7 Graupner | 9,578 | 8,887 |
| 11.5x10.2 Yoshioka | 11,916 | 11,341 |
| 13x6 MK glass | 11,967 | 11,494 |
| 11x7.5 Airflow | 14,171 | 13,434 |
| 11x5 Top Flite | — | 14,716 |
| 10x4 Zinger | — | 16,511 |

Performance Equivalents:

| | |
|------------------------------------|-------|
| BHP/cubic-inch | 3.02 |
| BHP/cc | .18 |
| Ounce-inch/cubic-inch | 221.2 |
| Ounce-inch/cc | 13.5 |
| Ounce-inch/pound | 142 |
| Gram-meter/cc | 9.42 |
| BHP/pound | 1.94 |
| BHP/kilo | 4.28 |
| BHP/square-inch frontal area | .306 |

Manufacturer: Enya Metal Products Ltd., Tokyo, Japan
U.S. Distributor: Altech, P.O. Box 286, Fords, NJ 08863

shaft is hardened steel and has an integral prop stud and crankpin. (It's the .60 XF crank, but its bore is larger: 11.02mm—increased from 10.85mm).

With a choke size of 10mm, the carburetor is Enya's latest GM type, and it's on the .60 XF helicopter and R/C, aerobatic, fixed-wing engines. It has rotating steel throttle barrels, and the mid-range slot in the rotating spray bar is widened to the same size as that in the .60 XF heli engine. In my experience, this prevents the full leaning-out of the mixture at mid-throttle positions, even when using the full range of available adjustments. I was surprised that in this test of the .80, what's nominally the same setup resulted in a fully controllable range of rich-to-lean at the "part-throttle" settings.

The point seems to be that if the tapered slot is the right size, then Enya's unusual mid-range control works perfectly—if not, then it doesn't!

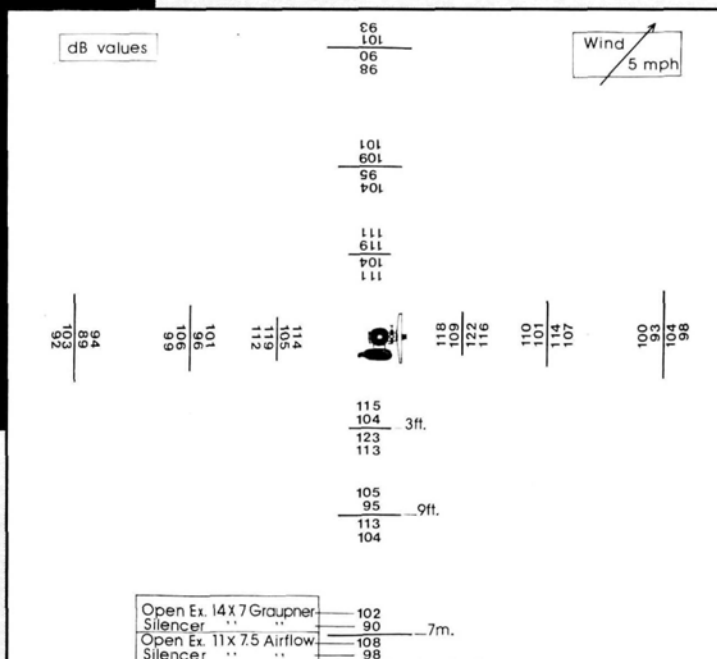
I don't know why the .60 heli engine showed excess richness in mid-range whereas this .80 doesn't. The .60 unit had a gear-pump fuel feed, and perhaps the heli application needs the extra richness. It's also possible—but unlikely—that the radial alignment of the milled slot in the spray bar is inaccurate.

PERFORMANCE

Compared with the amazingly short ABC times, the combined steel-liner/iron-ring/high-expansion piston needed a longer-than-average running-in period, and prop rpm increased gradually over $\frac{3}{4}$ hour. It was soon quite clear, however, that the .80 XF would happily trundle along on propellers with quite a lot of inertia. The 18x8 Top Flite was given an airing after $\frac{1}{2}$ hour. Its 5,206rpm are really the lowest at which it's practical to operate the engine, and the 16x6 Airflow was a more realistic size for lowest-rpm use.

At the other—higher—rpm end, the 11x5 Top Flite is too small, and judging by the test engine's open-exhaust performance, propellers ranging from 12x6 to 14x7 look suitable. More precisely, flight rpm from 9,000 to 13,000 (though low rpm may be as low as 7,000) are useable.

(Continued on page 74)



SOUND LEVELS—dB

| | |
|------------------------------|---|
| Engine: | Enya .80 XF 2-stroke (12.5cc) |
| Equipment: | Open exhaust; Enya muffler |
| Fuel: | 10 percent nitro/20 percent castor/70 percent methanol |
| Engine position: | 3 feet above hard earth |
| Temperature: | 52°F. |
| Humidity: | 70 percent |
| Propellers: | 14x7 Graupner and 11x7.5 Airflow |
| Mean rpm: | Open exhaust: 9,400 and 14,000 Muffler: 8,650 and 13,200 |
| Sound meter: | Radio Shack's Model 33-2050 set 38 inches above the ground and pointing horizontally to ward nearest sound, i.e., propeller, muffler, or open exhaust outlets. Three distances were measured: 3 feet, 9 feet and approximately 22 feet. |
| Meter settings: | "A" Scale and "Slow" response. |

BASICS OF

OF RADIO CONTROL

by RANDY RANDOLPH

Random thoughts

IN MODEL Airplanes, vibration should be avoided, or at least reduced to a minimum. I've discussed at some length the value of decreasing the vibration caused by our internal combustion engines, so I won't repeat the discussion here.

For quite a while, we've used a variety of mounting methods to reduce the vibration produced by larger engines—especially for some of the rougher-running converted chainsaw engines that were initially



Finally, this new mount reduces vibration on smaller engines. It's about time!

introduced for 1/4-scale airplanes. The success of such vibration-reducing mounting systems led to the introduction of similar mounts for the larger, 2-stroke model airplane engines in the .40 to 1.20 range, but what about the smaller engines?

The product shown in the first photo has been somewhat slow in coming to the market. It's a vibration-dampening mount for engines in the .09 to .15 range, and it doesn't take

up much room or add weight to the point of being impractical. Produced by J'Tec*, it's also available in .20 to .25 sizes, and it should be in most hobby shops by the time you read this. Regardless of engine size, reducing vibration can increase airplane and radio life.

COMING CLEAN!

At the end of every flying day, we usually clean the oily engine exhaust off



A 50-cent bottle of alcohol with a throw-away spray is very handy at the field or in the shop.

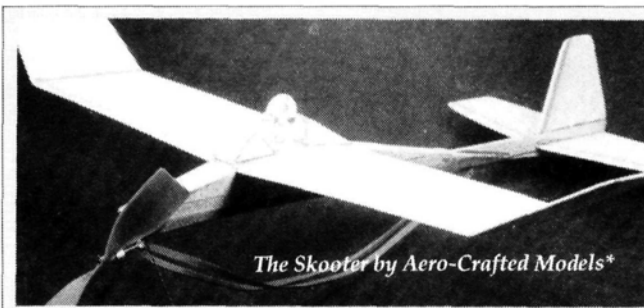
our planes' flying surfaces. For this, keep a handy pistol-grip spray bottle of rubbing alcohol in the flight box. Rubbing alcohol is in-

expensive, and the spray bottle comes with many cleaning products.

Rubbing alcohol is also good for many cleaning jobs in the shop—engines, electronic parts and tools, etc. Because it evaporates faster than water, it has less tendency to rust metal parts. What's more, a good spray of alcohol will keep little wounds from becoming infected.



Fingernail polish in the shop? Might not be so silly after all. (See text.)



*The Skooter by Aero-Crafted Models**

"QUALITY" TIME

The term "quality time" has been used during recent years in reference to the time we spend with our children, and there's no better way to spend time than at the bench or at the field with a son or daughter. The families whose members fly together are among the happiest, most well-adjusted people in our society.

This type of relationship doesn't come about accidentally, or as a last-resort effort by parents, but is an extended relationship that begins when the child finds the parent's hobby a way of attracting and keeping that parent's attention. Don't force them, but be ready when they're ready.

Obviously, a young child can't grasp the concepts of modeling in the same way as the parent, but he or she might feel rejected if left out of parental activities. A single rejection may be enough to destroy a relationship that could have brought a lifetime of fulfillment to parent and child.

A simple rubber-powered airplane that's built with the help of a parent can give a child a feeling of belonging. When the parent goes flying, so can the child! Besides, kids are great companions, and remember how good it felt to share grown-up things with your parents?

There's another large benefit; mothers tend to approve of activities that offer them a chance to be free of child care for a few hours each week. You old-timers: that works with grandchildren, too...

RECYCLING

Certain other throw-away items can be very useful in your workshop. Don't let family members throw their fingernail-polish bottles into the trash. Clean them—and the important brush that's attached to the caps—with acetone or lacquer thinner, then fill them with model paint, which you can use to touch-up dings and dents. The beautiful part is the brush! After using it, there's no need to clean it; just put the cap back on the bottle.

**Here's the address of the company mentioned in this article: J'Tec, 164 School St., Daly City, CA 94014. Aero-Crafted Models, 2713 Summit View, Bedford, TX 76021.*

FAT CAT

by RALPH H. PEARSON

Unusual profile isn't just cosmetic; lifting fuselage improves performance

THE FAT CAT is the fourth in a line of lifting fuselage designs. The first—a scale “Shorts” SD3-30 commuter—wasn’t my design, but with its unbelievably slow landings, it started me thinking about making something similar.

My first attempt was a simplified twin that performed way beyond my expectations.

Next came a 36-inch-span, low-wing, fully symmetrical airfoil design that was an instant delight. Called “Fat Albert,” its stall characteristics had to be seen to be believed.

Then I saw the quiet, well-behaved K&B* Sportster .20 engine, which had become very popular. I just had to build a plane around one, and a larger Fat Al-



bert—the Fat Cat—was next in line.

CONSTRUCTION

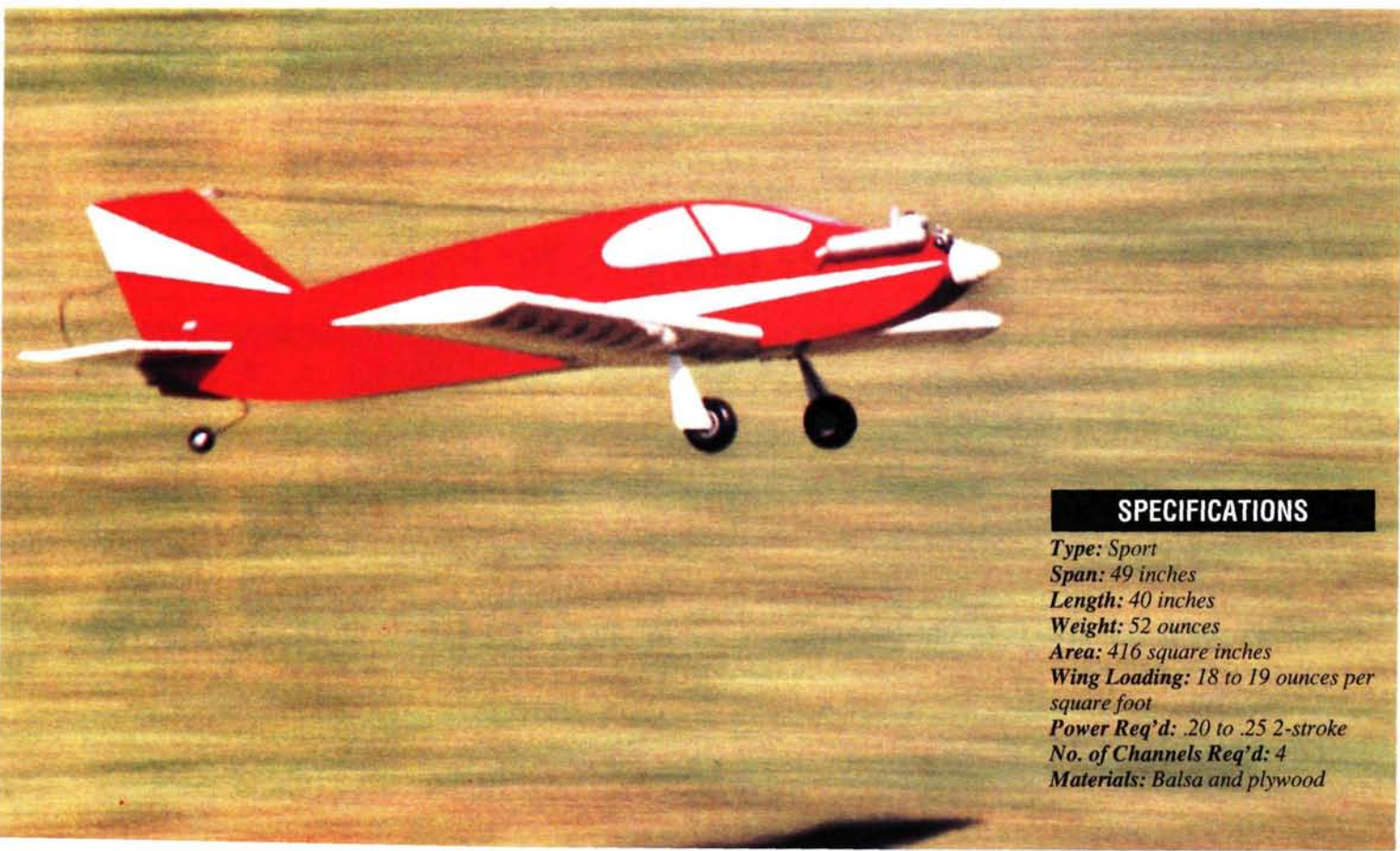
Fuselage: It’s easier and more accurate to construct the inner framework and doublers first and then apply the outer sheeting.

I used my favorite glue (a 50:50 mixture of Elmer’s Carpenter and Elmer’s

White Glue) for all the inner structure. It sands easily, and during sanding and rough handling, not one joint failed on the frail aft portion. Make two identical wing-saddle doublers. Make an accurate cut at the wing leading edge, and to within $1/16$ inch for the remainder. (This will be removed when you fine-tune the exact wing position.)

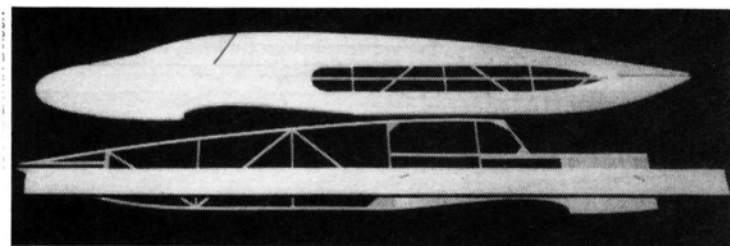
Start the inner construction with the wing-saddle doublers. Pin this member down, followed by all the $1/8$ -inch framework—the perimeter, verticals and diagonals. The vertical grain in the tank area should be fitted carefully before you glue.

Build another side directly over the first, with wax paper between them, and for maximum strength, allow to dry for



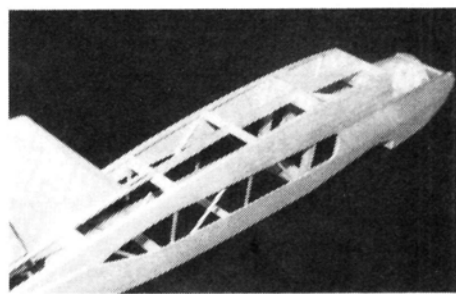
SPECIFICATIONS

Type: Sport
 Span: 49 inches
 Length: 40 inches
 Weight: 52 ounces
 Area: 416 square inches
 Wing Loading: 18 to 19 ounces per square foot
 Power Req'd: .20 to .25 2-stroke
 No. of Channels Req'd: 4
 Materials: Balsa and plywood



Basic structure of right side (bottom) before addition of sheeting. Top: completed side. Makes a light, strong component.

member on first, making sure it extends beyond the firewall to the nose. The upper (straight and square, as before) starts at the rear of the hatch and runs parallel to the



The fuselage almost completed, with the vertical fin temporarily attached.

several hours.

In the interim, make the firewall and bulkheads and select the $\frac{1}{8}$ -inch balsa outer cover. Since the outer cover is made up of several pieces, select firm, strong balsa for the lower member. Use lighter stock for the rest. (I always order more balsa than I need.)

Before gluing on the side sheeting, sand both inner assemblies on both sides. Pin and clamp them together, and sand the perimeter until you have two identical sides.

Before cutting the lower cover piece, make sure the upper edge of the sheet is straight and square, then measure and cut off a width of $1\frac{1}{2}$ inches. Glue the lower

lower. Cut off the excess close to the fuselage and use for "fill-ins."

When you've completed both sides, pin, clamp and sand the perimeter as before. Make sure $\frac{1}{4}$ -inch balsa will fit smoothly and level in the stabilizer slot, as you'll use this when aligning the fuselage sides.

Mark the center line on the bottom of bulkheads 2, 3 and 6. Lay one fuselage side down flat, and glue bulkheads 2 and 3 90 degrees to one side. Make sure no. 2 is flush with the hatch seat and no. 3 is flush with the bottom edge.

Hold both sides on the top view and clamp lightly. Place a scrap piece of $\frac{1}{4}$ -inch balsa sheet under the fuselage just behind the no. 3 bulkhead. Weights on small boards at the fuselage opening behind no. 3 and at the tank location area will hold the fuselage steady. Temporarily put a piece of $\frac{1}{4}$ -inch sheet balsa in the stabilizer slot. (This should be level with the board.) When all is square and level, glue the bulkheads into place, and use corner braces to "lock-in" this box section.

With the weights in place, glue bulkhead no. 6 into place, but only if all bulkheads are on the center line and the fuselage is $2\frac{1}{2}$ inches wide at the tail end.

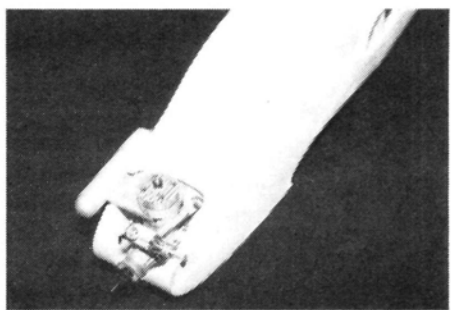
My fuselage had a natural, symmetrical shape, so I simply added upper and lower braces at stations 4 and 5. Don't glue in the firewall at this time. Put the fuselage aside and move on to the wing.

Wing: This wing is 1 percent thicker at

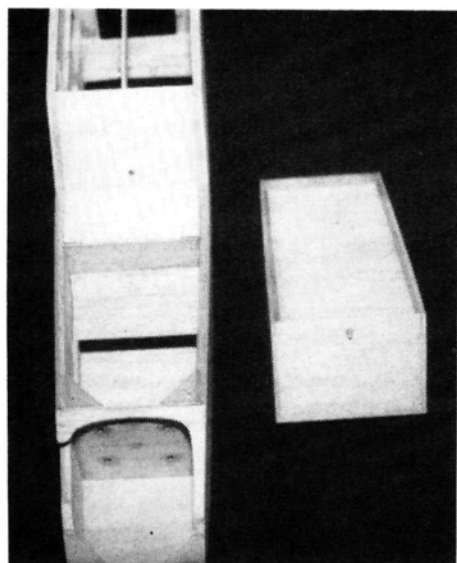
the tip. I've successfully used this "cure" for tip-stalling for many years, but an incidence gauge is a must. You just can't "eye" a fully symmetrical wing. Remember, it's 0-0-0 degrees from tip to tip.

Ribs are formed sandwich-style by bolting 12, $\frac{3}{32}$ -inch balsa blanks ($\frac{3}{32}$ inch is vital for a proper outcome) between two $\frac{1}{16}$ -inch ply templates. Bolts must be at least $1\frac{1}{2}$ inches long. Lay the tip template (centered depth-wise) over the center template, with spar slots in alignment. Drill bolt holes where indicated. Harden the perimeter of the templates with CA before and after each sanding session. Rib blanks are shown on the plans. Any attempt to take a shortcut will lead to frustration—I've been there!

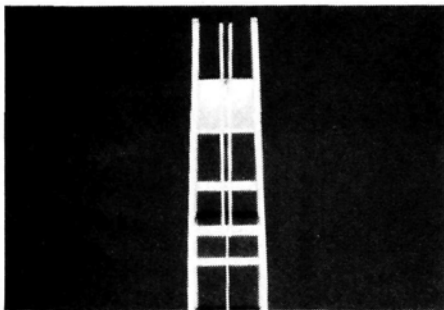
Be sure you make a left and a right set of ribs. For "flat-on-the-board" building, the templates have a 90-degree angle at the trailing edge. When drilling the blanks for bolt holes, the first eight on each side



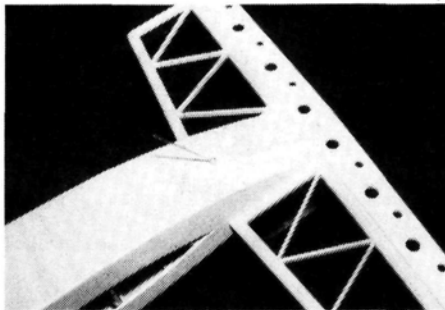
Engine is accessible for servicing and adjusting. Note muffler is tucked neatly along fuselage side.



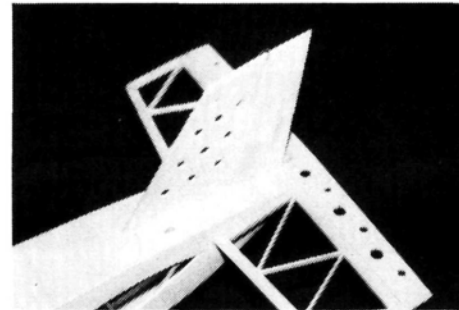
Top front of fuselage with removable "windshield." Neat work is evident.



Aft end of fuselage awaiting the tail feathers.



Bottom of aft end of fuselage showing tail wheel/rudder wire protruding from lower sheeting.



Lightening holes were cut in vertical fin and elevator—not necessary, but they do reduce the likelihood of needing to add "dead weight" up front for balancing.

are no problem. To avoid short-sheeting on the last four, use the tip template, centering it vertically, with 40 percent of the balsa in front and 60 percent in the back. Mark and drill all 24 blanks, one at a time.

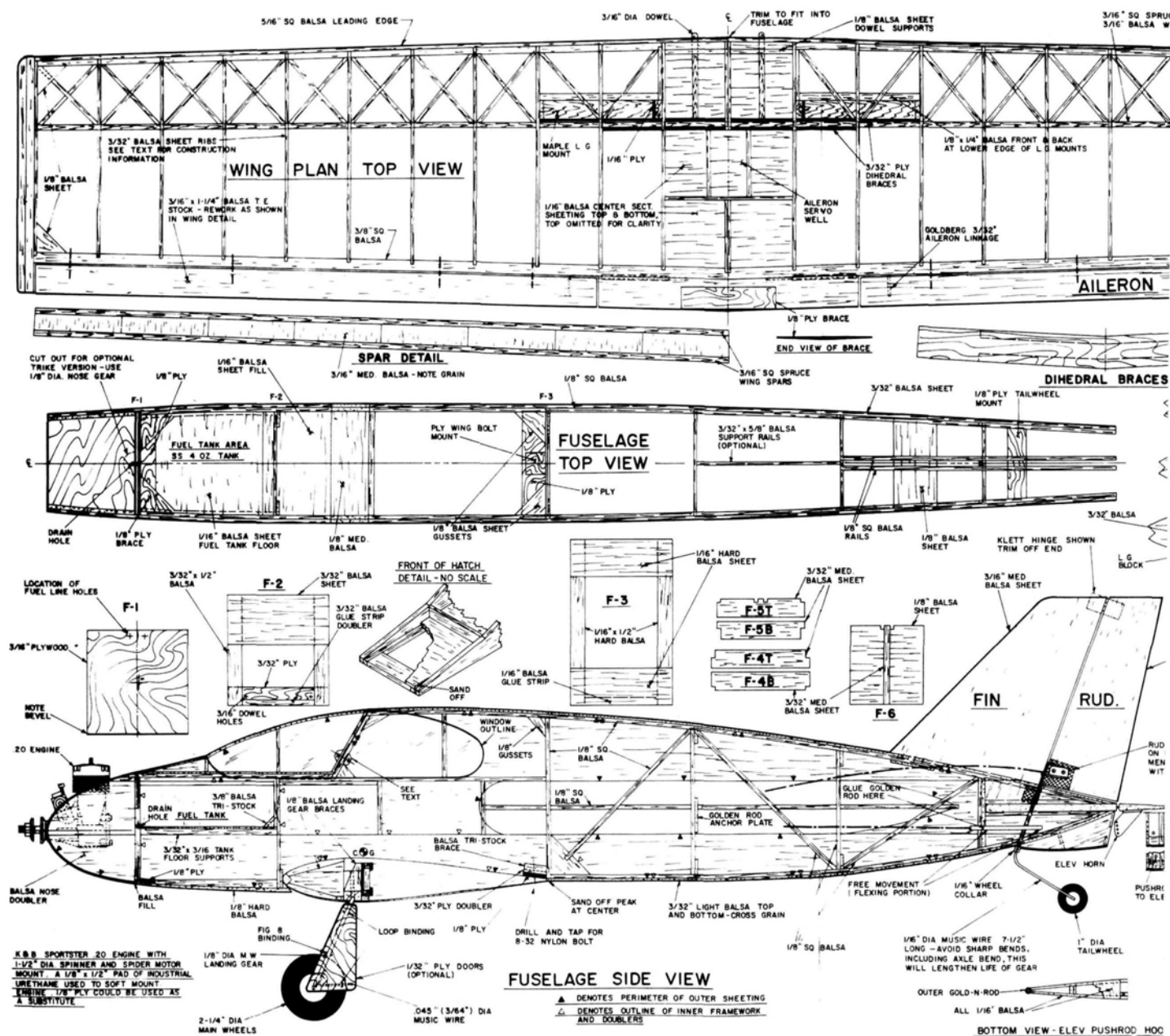
When tightened, the bolts should be parallel, top and end view.

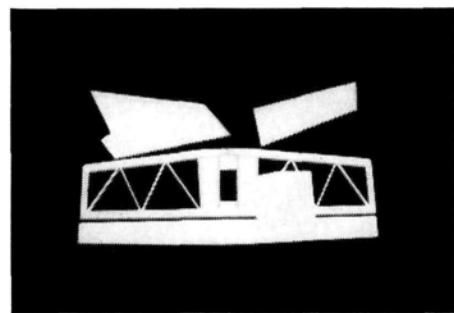
To shape the ribs to within $1/16$ inch, use a saw, a sharp knife and a plane. Sand the remainder, always across the blanks, in

the direction of taper. Use coarse, medium sandpaper, and finish with 150-grit. I used a $3/32$ -inch drill, a broken jigsaw blade and small sanding sticks to form the spar slot.

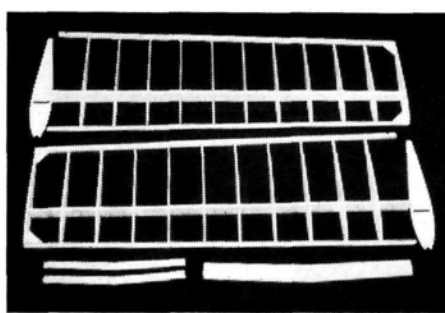
After unbolting them, you'll notice a

ORDER THE FULL SIZE PLAN...PAGE 122

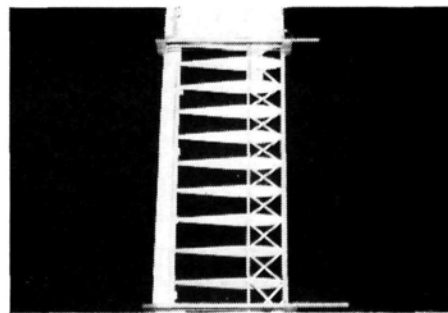




The completed empennage before covering.



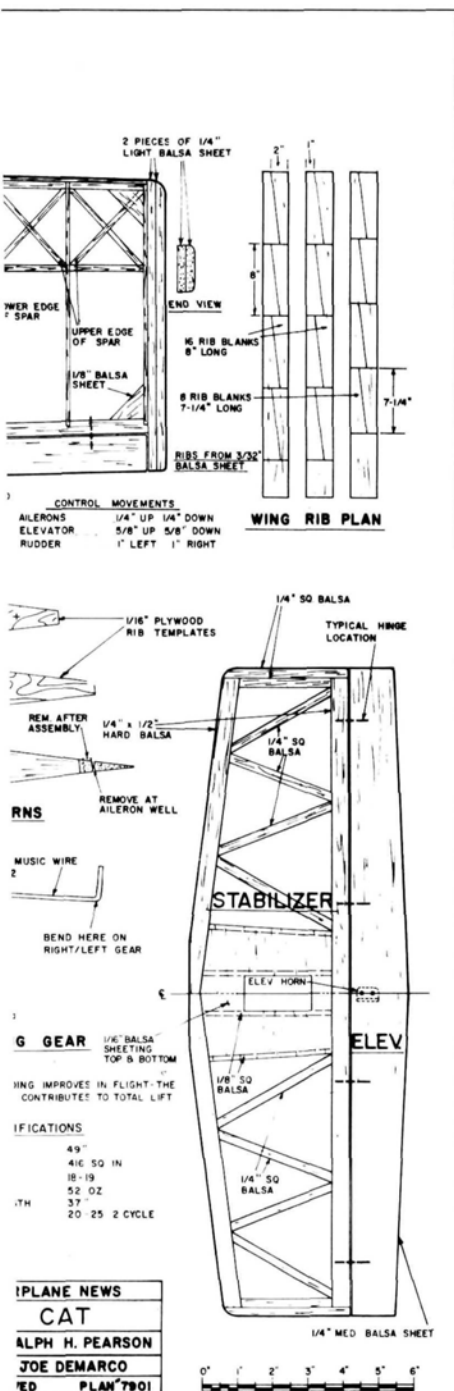
Both wing panels, before joining. Joiners and dihedral braces are shown at bottom of photo.



After basic framing, the wing's strength is increased by installing diagonal cross-bracing between the ribs, leading edge and spar.

chisel shape at each end of the ribs. Forget the front (it isn't that severe), and the rear will be "lost" in the notched trailing edge.

Build the spar now, selecting each



spruce piece for the straightest center grain. If you use CA for this assembly, be sure to rub baking soda into the spruce, then tap it on the floor or a table to remove any excess. The spars must be straight and to the proper size.

Enlarge the front of the spar slots on ribs 2 and 3 to allow for the dihedral brace. Pin down the notched trailing edge. Slide the ribs, except no. 1, onto the spar. Use small sticks and rubber bands to hold the leading edge in place at every other rib bay. To hold ribs 2 and 3 against the rear of the spar, temporarily slide the dihedral brace into place.

Lay this assembly on the plan, and locate the ribs according to each trailing-edge notch. Use long "T" pins at each end to hold the leading edge exactly at the center. Don't glue the ribs to the spar at this time. Line up the ribs in turn, and CA them at the leading and trailing edges only. To lock-in the assembly, glue in the corner braces at the tip, then build the other wing half.

Leave one half in place, and make a "dry run" with the front dihedral brace in place. Prop up the free half 2 1/4 inches at the tip rib, and check the fit at the center. If everything meets at the center line, with the spar straight and centered evenly on

the dihedral brace, CA the ribs (except nos. 2 and 3) to the spar.

Take both halves off the board. Sand the dihedral brace to remove any slick release agent. Using a slow-curing epoxy, slide the brace into position, with the leading and trailing edges meeting. Clamp the brace and remove the excess epoxy.

Lay one wing half in position and weigh it down with magazines. Remove the clamps, and prop the wing to the proper dihedral again. Glue the leading- and trailing-edge joints with CA, re-clamp the brace, and allow the CA to cure.

Epoxy the rear spar braces into place, one at a time, in such a way that you don't disturb the shape of the no. 2 rib. Fill the small notches with scrap balsa. Cut 1/16 inch from the top and bottom of ribs 1 and 2. Cut rib 1 to form the servo well. Glue on the 1/16-inch balsa center sheeting, but leave the bottom front open for now.

Prepare the strip aileron horns. Save the excess bearing material for later use. I find that the best tapered stock for both the trailing edge and the ailerons is 5/16 x 1 1/4 inches, so a little reworking is necessary. This isn't all that bad, as you'll seldom find a tapered piece that's straight.

When the aileron linkage is in place and

(Continued on page 80)

FAT CAT



#7901

FAT CAT

\$10.50

Here's a sporty-looking, .25-powered design that uses its fuselage shape as a lifting surface to enhance its already great performance. With a 49-inch wingspan, it's easy to transport, and its light wing loading makes it comfortable for a relative newcomer. Conventional, commercially available materials are used in construction, and the large, single-sheet drawing makes the Fat Cat easy to build.

GOLDEN AGE

OF RADIO CONTROL

by HAL DEBOLT

THE STORY CONTINUES!

IT NEVER REACHED the heights achieved by the "big three," but the Detroit-based Min-X Radio Corp. made a positive contribution to the hobby from the early single-channel days to the digital proportional era. In my history of R/C, I've so far said little about it, but the company's efforts covered the complete spectrum of R/C concepts.

I'm indebted to Jim Northmore, one of the owners of Min-X, who put together a considerable amount of information for us. Jim was the operation's "business brain," while John Krauer and Bill Bertrand were the engineer and product developer.

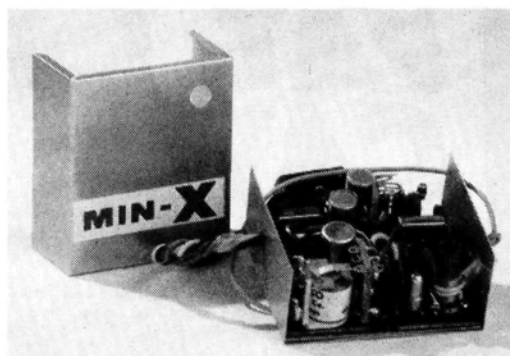
Jim says they did all their radio testing with a Live Wire Champion that he still flies occasionally! He says: "The Champ was used with the first Min-X super-regen single channel, then the superhet single, the pulse systems, the reed multis and, finally, the Astromite proportional." Min-X was almost the only manufacturer that offered equipment in all phases of R/C—from rudimentary systems to today's digital equipment. Imagine the time spent on the development of each concept as it was evaluated and brought to flight status. What dedication!



Min-X was probably the only major manufacturer offering a pulse-style multi system. Designed by Jack Lemon, it was for three controls. The Min-X story begins in this issue's "Golden Age."

From the beginning, the gold color and the bold logo on Min-X equipment stood out. The company's first offering was a single-channel, hand-held transmitter on the 27MHz band; it had a matched, super-regen receiver, and the miniature Jaico relay operated the industry-accepted Bonner escapements. The need for better interference rejection resulted in the in-

roduction of a superhet tone style, which replaced the super-gen. Later, an all-transistor receiver modernized the SC system. Specs for this receiver claimed: a weight of 2 1/2 ounces; no need for a "B" battery; and exceptionally high current for solid relay operation. Compared with the attributes of previous SC receivers, these specs were admirable. The receiver's total



Min-X Radio Corp. was one of the original American R/C manufacturers. This was their final upgrade for single-channel: a superhet, all-transistorized tone receiver. They didn't get more sophisticated!

weight, however, was more than that of our modern 5- or 6-channel equipment. We've come a long way!

PULSE PERFORMANCE

At that time, "pulse"-style operation was popular with many experimenters, and Walt Good's TTPW system led the way. Min-X saw its possibilities and developed its own version—soon, the only major brand: the "Pulsemite," which was a basic, pulsed, 2-channel with a third control of some other type. The Pulsemite receiver was Min-X's standard superhet adapted for pulse use. Obviously, the transmitter was designed to include the pulse generators, and it had servo centering levers that resembled today's trim levers. Of course, special servos were necessary, and those shown seem to be of German origin.

The explosive arrival of the reed systems for multi use ended the production of the Pulsemite. Min-X entered the reed market very strongly, offering complete systems, from the least expensive 4-channel to what one columnist labeled a "mega-buck 12-channel." Prices of some of the top-line reed systems were in the \$500 to \$600 range, which is scary, even today!

ZACH IS BACK!

After enduring poor health for 17 years, Zach Allerton of Volant, PA, is happy to be back in the

hobby, and he says that during his hiatus, he was sustained by his memories of R/C activities.

In 1938, he bought his first model—a Trenton Terror that was powered by a \$10 Brown (he couldn't afford the \$21.50 version). During the Depression, manufacturers were hurting; they tried their best to provide equipment people could afford, but economic reality

fought us all the way.

Zach's flying buddy was R/C pioneer Alan Greer of Pittsburgh, PA, and my story about the Dart family brought back memories, because they attended some of the Dart's "doings." Like so many of you, Zach recalls all the early Live Wire designs, and his fondest memory is of winning a 4th-place medal with his Champ at the 1958 Nats. He

also remembers chatting with me as I tested my Custom Bipe.

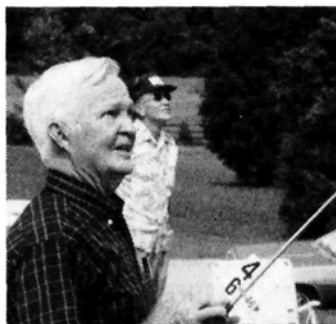
SELINGSGROVE SEARCH

Zach remembers the Indiantown Gap fun flies, which were an outgrowth of the annual Selingsgrove meetings. These invitational meetings were sponsored by the Pittsburgh Arcs and were a real showcase for much of what has become

R/C history. The R/C top guns of the time gathered to show off innovations and skills; Good, Walker, Lorenz, McEntee, Northrup, etc.—the R/C aristocracy. Newcomers who somehow managed an invitation learned so much on those Labor Day weekends.

If someone out there has any Selingsgrove photos and/or information, please share it with us; it would

ANOTHER ONE FOR THE AMA HALL OF FAME...



H.A. today, in his favorite role: check-flying a newcomer's first R/C creation.

We all know that there are many unsung heroes of early R/C. At local levels, they spread the R/C gospel, and Henry Thomas, who was recently inducted into the AMA Hall of Fame, is an outstanding example of such a disciple.

In his own subtle way, Henry has helped many of us during his 60 years of modeling. Just ask anyone out Arkansas way about "H.A.," or ask any of the R/C pioneers. If you needed

help, information, or just wanted a flying buddy, you only had to ask H.A. He would stop what he was doing and lend a hand.

Henry was an advertising agency executive in the Little Rock area, and his wonderful drawings explained and simplified the mysteries of early R/C. His illustrations appeared in the long-running "Sketchbook" series in Bill Winter's magazines and books. Henry was one of three people who led us all to R/C success, because his illustrations complemented the writing of Howard McEntee and Ed Lorenz.

At age 75, when most pioneers just sit back and revel in their "war stories," Henry is still a very active modeler. He designs, builds and flies a variety of models, from cute scales, like a Spit-

fire, to classy-looking, sport, cabin styles.

I recently persuaded him to share some pictures of one of his first R/C efforts with us. The photos show a pusher R/C that would be regarded as unique and stylish, even on today's scene. Built and flown in the early '50s, it was rudder-only, used a C-S 465 radio and was powered by that delightful Arden 19. Henry's first attempts to steer it with only one operational rudder proved inadequate, but when the second rudder was operating, control was excellent. Several of the photos show some of the unique ways in which Henry provided unobtrusive access to equipment. Such ingenuity!

Unfortunately, Henry didn't have the model long enough to come up with an



This montage of Henry Thomas's early magazine illustrations only hints at his output. If there was a doubt, Henry showed us what it should look like!

appropriate name. After about 12 enjoyable flights, a "stuck relay" caused it to spiral up into a clear blue sky, and it disappeared—forever!

Sponsoring Henry's induction into the Hall of Fame is our way of honoring and thanking this one-of-a-kind modeler for his lifelong service to the hobby. With Lt. Col. William Kaluf and Bill Winter, I'm proud to be his friend and to have been able to honor him in this way. It's an honor that's so well-deserved.



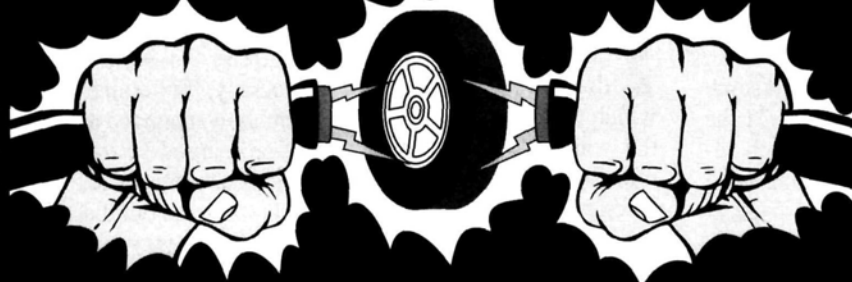
From the early '50s, this modern-looking, single-channel pusher is by Henry Thomas. It was designed to fill the major needs of that time.



The Thomas pusher featured so many unique ways to install the needed equipment unobtrusively. Everything under hatches!

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make great reading. Are any of the Arcs reading this?; how about old friend Fred Collins?

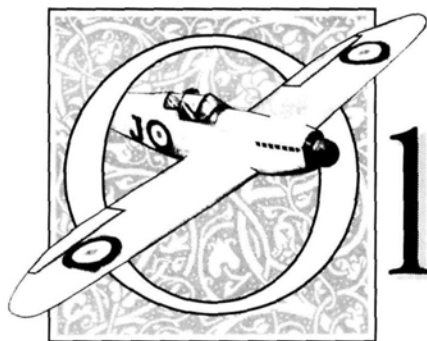
MINNESOTAN MEMORIES...

So many made their first successful R/C flights with the Citizen-Ship 465 that it was obviously a key-stone in the growth of R/C. Ed Lowe, of Hodingford, MN, notes that the complement of batteries required for this single-control system was outrageous compared with what's required today. You needed a 67 1/2 V "B" battery, five "C" cells for "A" and two more "C" cells for the escapement; and you had to change them every few flights!

Most of the early 465 planes in Ed's area were converted free-flights à la the Berkely Brigadier. A McCoy .09-powered LW Trainer thrilled them with more realistic flights: you pressed the button and the Trainer actually turned! Progress followed the usual path: from dynamotor-powered, ground-based TXs to hand-held Mac "Two Tubers," Sigma 4fs, Rk 61s, Bonner escapements, pulse systems and, finally, a Cannon 5-channel propo kit, which, once assembled, worked well (Ed still has it!). He says there was more satisfaction gained from success with home-built equipment than from succeeding with today's sophisticated store-bought gear. (But he wouldn't trade back!)

Ed asks if Ace R/C's system is the only one available that's made in the USA. How about Cannon R/C? Can someone answer Ed's question? Are there others built in the good old USA? Input appreciated!

Finally, Ed notes that I classified Walt Good's Guff as "antique R/C," and since he had one as his first R/C plane, he asks what the classification makes him! Well, Ed, the Guff was before my R/C time, so if the shoe fits, wear it! Be proud of where you've been! You must be eligible for the Vintage R/C Society, which should be planning some activities for this season. You will join, won't you? Out of time till next time... ■



ld-World

MODELING

by DUKE IDEN

A THIN KID who started to shave last month reluctantly puts down a Batman comic book and gives you a blank stare. You want to know if channel 36 is "safe" in your area... "Don't know, but—hey!—I just figured out 'Frog Smasher' on that video. If you cream the Swamp Thing first, you get an extra 100,000 points!"

The room seems large, but that's because there's a lot of empty space. Three kits grace the wall: a Cap 21, a World War I scale plane and a six-engine B-36. The glass counter case houses a .049 and a 3.60 supercharged 4-stroke with a price tag of \$999. This is reality—the hobby shop of the '90s.



Alan Woolidge, manager (right) and Tom Ratcher may be saying, "Welcome to Ye Olde Hobby Shoppe." English and French hobby shops place the highest value on stocking everything and giving personal service.

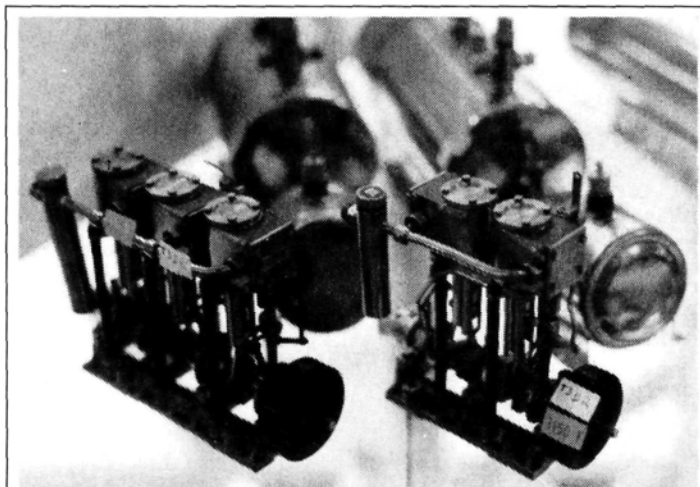
It wasn't always like that. Imagine a hobby shop with wall-to-wall "stuff" tended by an experienced, older, smiling

assistant who is ready to answer all your questions. You ask if he has a twin-cylinder, 2-stroke .41 engine with Tharp carburetor... "Of course; would you like to see one in a standard finish, or perhaps in a gold-anodized color." Great, but will it fly my Star Torque Bipe? "Of course it will, if you mount it inverted and break it in on the third Tuesday of the month..."—the way it was, circa 1950.

RETURN WITH US NOW...

The local hobby shop that once catered to all your modeling needs is disappearing. We've capitulated to the one-eight-hundred number, the plastic card and UPS. (Yes, in many homes, the big brown truck is referred to as the "airplane

Oceans
apart, but
still a lot of
common
ground



Along with a wide selection of car and plane needs, the French shop sports the uncommon. Could a Sig Kadet fly with steam power? Two-cylinder model engine costs the equivalent of \$525, and the boiler would cost extra. Three-cylinder model costs about \$690.

PHOTOS BY DUKE IDEN

truck.”)

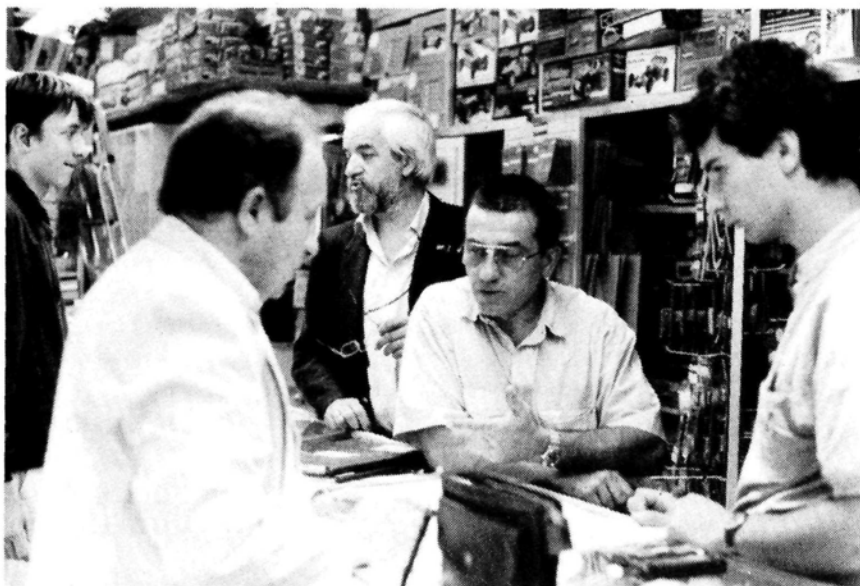
But if you long for the days of the hula hoop and Ike, there are still places where the wise old owner stands amid piles of hobby goods and is ready, willing and able to help you. Just take the great silver bird out of Kennedy Airport and put down at Heathrow; grab a London taxi and seek out a British hobby shop. Yes, the olde worlde hobby shoppe is alive and well in England and across the Channel in France, but it isn't all a bed of roses.

HOBBY HEAVEN!

I first saw paradise in London, when I visited Aero Nautical Models in Camden Town, where manager Alan Woolidge has been involved in the hobby for about 25 years. His shop is well stocked, and many of the kits bear familiar names like Top Flite, Sig and Goldberg, but there were also many beautiful scale kits that would send dribble down any Yankee chin.



"Bonjour monsieur," says Patrick Bessede, "director" of EOL Modelisme hobby shop in Paris. M. Bessede won't sell anything to anyone until he meets them. No first-time mail order accepted here!



French modelers get one-on-one attention. This type of service is still found here in the States, but it's declining. Although the French service is excellent, there is a price.

Do British modelers have enough flying sites?

"...in the middle of a town, forget it. In the wild countryside, you can usually find a field. In London, I fly at only one site, and we're often thrown off. We might have to go 40 miles (to find a site). In the States, 40 miles may not be far, but in London's heavy traffic, it's a long way."

Are U.S. hobby shops competing against distributors?

"Distance is the main difference between the British and American markets. In the U.S., your local model shop might be 150 miles away, so you order by mail. Using available magazines, you find the best price, make a phone call, and buy what you need with your credit card. In England, it's

different. In the London area there are about 10 hobby shops, so modelers can actually talk to the person who is selling the kit: "I'm a club member, do I get a discount?," etc.; in America, model shops don't seem to have much stock; it's all about mail order. Here, people want to see what they're buying, and they will come in and look. There's no inventory tax in England." (Funny how we fought them about taxes; wonder who won!)

Radios have their own special problems in England. The R/C rigs there operate on 35 megs, and 20 spots are allocated for planes. The trouble arises because in a much smaller, more densely populated country, flying sites are closer together, so one chap might be flying at one site and, four miles away, someone else is flying. If both are on the same channel...well, you get the picture.

How are radio problems handled?

"In some areas, we have "odds and evens"—the numbers on the frequencies. If two clubs are close, one club will run even, the other odd, but it's confusing to the modeler, and their ignorance is the biggest problem."

With such a shortage of wide open spaces, are 4-strokes popular?

"No. Cost is a problem. You pay £40 to £50 (about \$70 to \$85) for a 2-stroke engine, but a 4-stroke engine costs £99—twice as much. To me, the 2-stroke is a racing engine: it revs, it's powerful, and it can race around the sky. The 4-stroke is a good, reliable, quiet engine—a 'plodder' or a 'cooking' engine."

What about insurance here?

"Liability insurance isn't as much of a problem here as it is in the USA, because, unlike in the U.S., suing isn't a part of British life.

Are British model magazines more frank in product reviews?

"No. American reviewers are more honest. They say, 'The fiberglass is poor' and the manufacturer will improve it, but in England, the reviewer will say, 'There were a couple of blemishes.'"—ah, British diplomacy.

Our English cousins seem to pay a little more than we do, but they earn less. Alan said that model prices in

(Continued on page 83)



by CHRIS ABATE

SPECIFICATIONS

Type: Sport trainer

Span: 55.5 inches

Weight: 3 pounds, 4 ounces
to 3 pounds, 12 ounces;
review model: 3 pounds,
5 ounces

Wing Area: 440 square
inches

Wing Loading: 17.3 ounces
per square foot

Power Req'd: .20 to .30 2-
cycle; .20 to .30 4-stroke

No. of Channels Req'd: 4

Suggested Retail: \$54.99

Features: Balsa and lite-ply
construction; pre-shaped
wing leading edge;
notched trailing edge;
and three optional motor
mounts. Complete hard-
ware package includes
spinner, wheels, formed
cowl and wheel pants,
pushrods and hinges.
Also included are travel
gauges for measuring
flight-control-surface
throws, a general infor-
mation booklet, rudder,
elevator and aileron-
beveling tools.

Comments: The Freedom
20 is a complete, well-de-
signed kit. The die-cutting
of the balsa and lite-ply
parts is clean and accu-
rate, and the instruction
and general-information
books leave nothing out.

should make them both easy to build and easy to fly. The Freedom 20 from Carl Goldberg Models* hits the mark on both counts!

THE KIT

The kit contains good wood, and the die-cut parts are cleanly and accurately cut. There are no fiber-glass parts, but the cowl and wheel pants are of vacu-formed ABS plastic. The single-sheet, full-size plan is printed rather than blue-line, and it's extensively illustrated. The 58-page instruction manual has more than 150 illustrations to take you step-by-step through construction.

A second booklet, labeled "General Information," covers adhesives, radio selection and installation, balancing, covering, hinge installation, decals, alignment, engine set-up, flying the model and field equipment. Keep this booklet even after you've completed the Freedom 20; it's a good source of in-



FIELD & BENCH REVIEW
CARL GOLDBERG MODELS

FREEDOM²⁰

formation for future projects!

The hardware package is exceptional; it includes all the basic parts, plus a spinner and wheels. Also supplied is a sheet of Mylar decals, which includes cabin windows, a glare screen and other "scale-like" markings.

CONSTRUCTION

The instruction manual is divided into sections that address every part of the aircraft, i.e., tail group, fuselage and wing. At the beginning of each section, a line drawing identifies the pieces needed to build that particular aircraft part, and there's also a list of the necessary tools and adhesives.

Construction starts with the tail group, which has two parts—

What more can you say?
Carl Goldberg...Trainer...Excellent!

the horizontal stabilizer and the vertical stabilizer, or fin. Both structures are of an open-frame, stick construction, and they're built directly over the plan. The





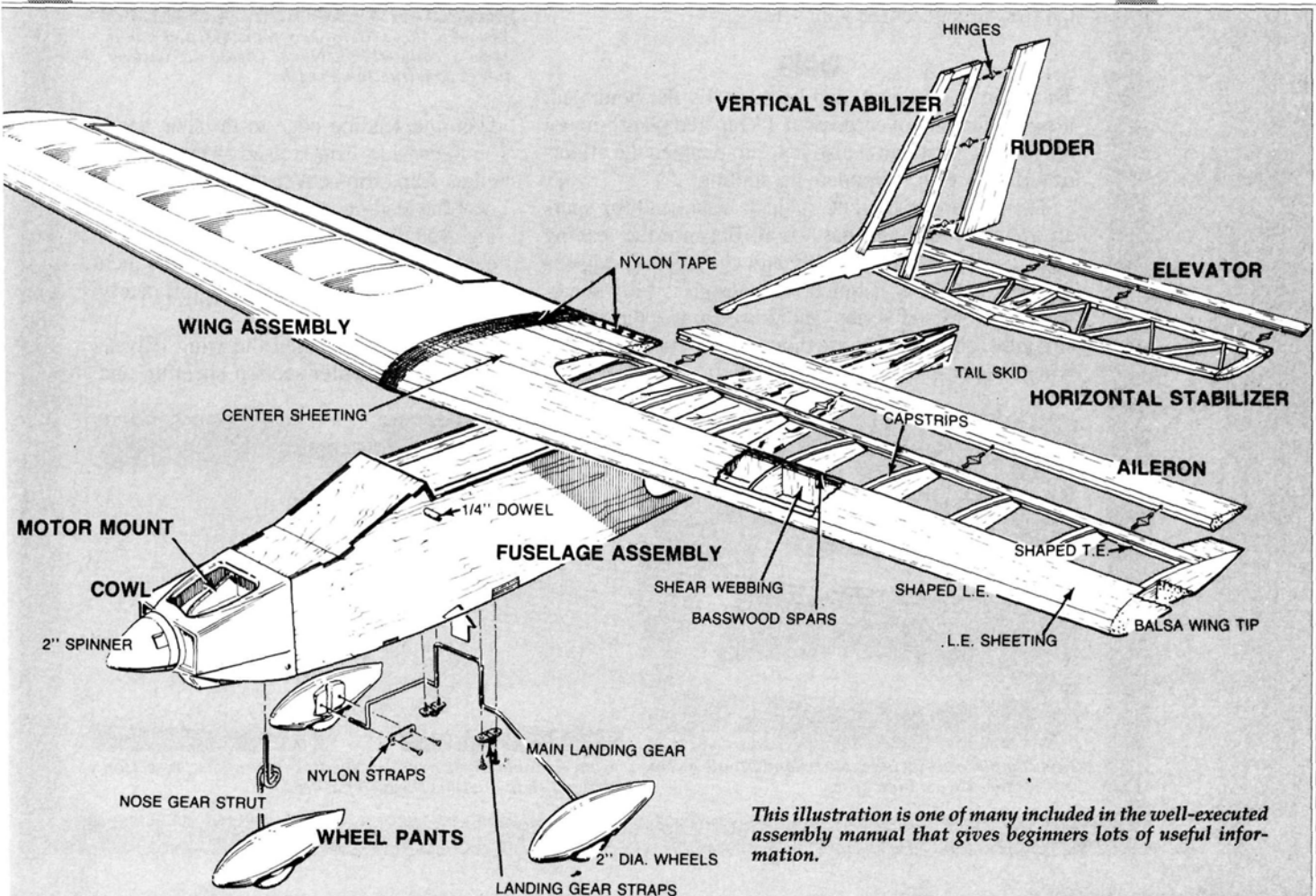
Kyosho's entry into the aircraft-radio-system field—the Series 91, 5-channel PCM. This company has long been respected in the surface-frequency car and boat radio market.

Long noted for its R/C car and boat kits (as well as 2-channel, surface-frequency radios to operate them), Kyosho has introduced a 5-channel PCM radio for use with aircraft. The Advance 5-channel PCM has an FM-PCM (Pulse Code Modulation) system; a 1991-type, narrow-band transmitter and receiver; a dual-conversion receiver with low-noise DBM (Double Balance Mixing); dual rates for both aileron and elevator; a fail-safe capability; and servo-reversing on all channels. The system includes a transmitter and receiver, four servos with hardware and trays, a charger, an aileron extension, a switch harness, full Ni-Cd batteries and frequency flags. For me, the Advance 5-channel PCM performed without any problems, and its price won't destroy your wallet!

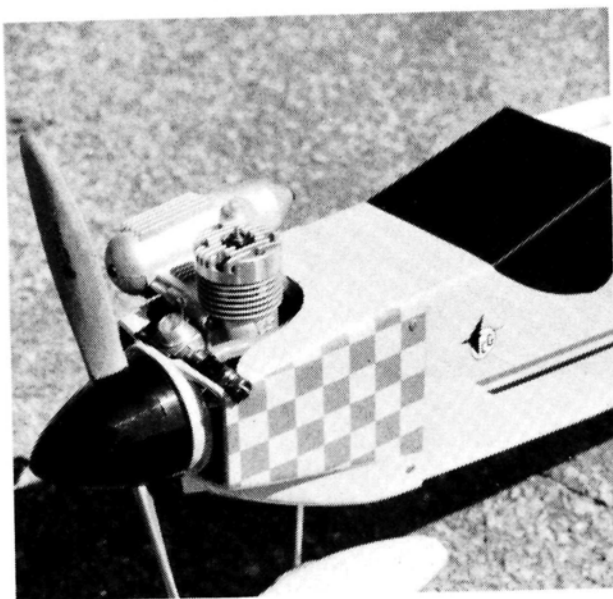
leading and trailing edges, as well as the tips of the vertical and horizontal stabilizers, are framed with $\frac{3}{16} \times \frac{1}{2}$ -inch balsa; the diagonal bracing is $\frac{1}{8} \times \frac{3}{16}$ -inch balsa. The tips and the center section of the horizontal stab are die-cut pieces, while the elevator and rudder are solid-sheet balsa that has been cut to size and shape.

FUSELAGE

The fuselage is made of die-cut, $\frac{1}{8}$ -inch lite-ply pieces that interlock using a tab-in-slot construction. This ensures proper alignment and positioning and makes assembly rapid and strong. To help minimize the model's weight, lightening holes have been cut in the fuselage sides and bottom aft of the cabin area. There are only two formers in the fuselage: one is the fire-wall, and the other is located at the aft end of the cabin.



This illustration is one of many included in the well-executed assembly manual that gives beginners lots of useful information.



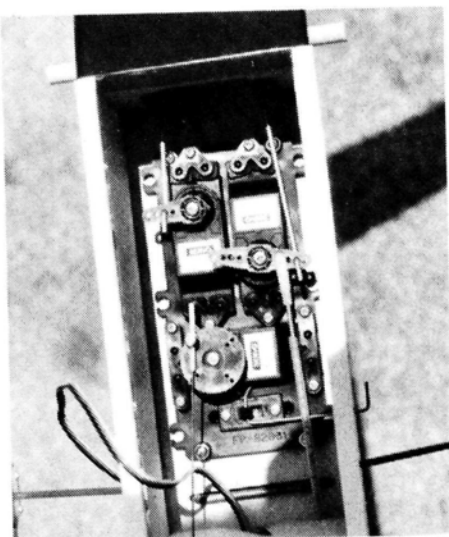
Apparently, no other formers are needed: because the top and bottom of the fuselage are solid pieces of lite-ply, they give the necessary rigidity and take the place of cross-bracing.

Motor-mount construction is next, and you have options. Three mounts can be used (your choice will depend on the engine size you choose), and all the parts are die-cut ply. The mount's side plates have tabs that lock into slots in the firewall, again to avoid misalignment. The motor mount can be permanently glued to the firewall or secured with screws.

WING

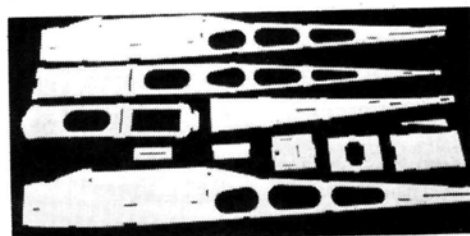
The wing comes next, and because it's flat-bottomed, it's built directly over the plan. Its tapered planform not only looks great, but it also helps to dampen the effects of turbulence and eliminate tip-stalling.

The ribs are of die-cut $1/16$ -inch balsa, and the spars are rugged, but light, basswood. Because the leading edge comes already shaped and the trailing edge is notched, assembly is quick. The design is fully shear-webbed between the ribs (and this increases the overall strength), and the webs are thoughtfully cut to size. The wing's upper surface is sheeted with $1/16$ -inch sheet balsa



Above: There's plenty of room for standard-size servos in the radio compartment. See sidebar for more info on the new Kyosho system shown here.

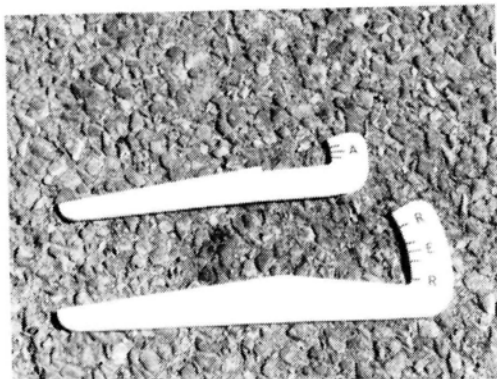
Above left: Spinner adds to the clean look of the Freedom 20, as do the supplied wheel pants, which are just visible in this photo.



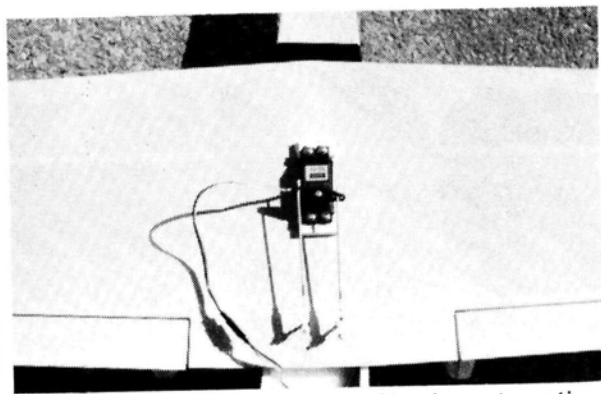
Assemble these lite-ply components, and you'll have a complete fuselage. Clean die-cutting makes construction a cinch.

from the leading edge to the spar, and a $1/2$ -inch-wide strip is used at the trailing edge. Cap strips cover the ribs and connect the leading- and trailing-edge sheeting. Both the top and bottom of the wing's center section are covered with $1/16$ -inch balsa. The strip-type ailerons run nearly the length of the span.

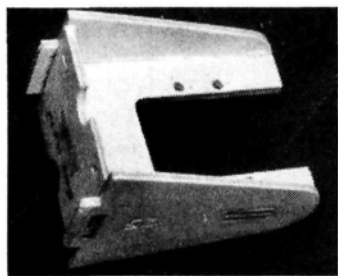
After you've joined the wing halves, add the top center-section sheeting and



This complete kit includes such handy tools as control-surface throw indicators.



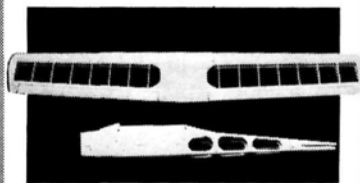
Conventional aileron servo is located in wing center section, driving strip ailerons through pushrods.



Built-up engine mount is different, but works well. It may be screwed or epoxied into position.

wrap the center section with fiberglass tape for added strength. The wing is held in place on the fuselage by no. 64 rubber bands—an old, but very sound, method, especially for trainers!

The final assembly step is joining the wheel pant and cowl halves, which are vacuum-formed ABS plastic. (I think this material should be thicker.) The bottom of the wheel pants should be cut out



Wing and fuselage in frame. The tapered planform is nice to see.

(for the wheels), as should the cowl (which must accommodate the engine).

I discovered only four mistakes in the manuals and plan sheet. They were easy to find, because the corrections were on a separate sheet of paper in the kit! I appreciated this, because it lets you know that the manufacturer caught the mistakes and remedied them at the factory. I found no other errors, and I didn't need to modify any of the construction techniques in the manuals.

COVERING

When you think you're ready to cover, check for rough spots and take the time to finish-sand all the parts. (A little care and patience at this point will be rewarded ten-

(Continued on page 88)

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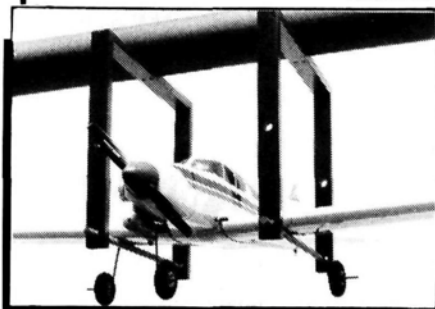
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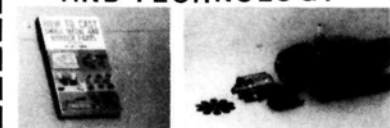
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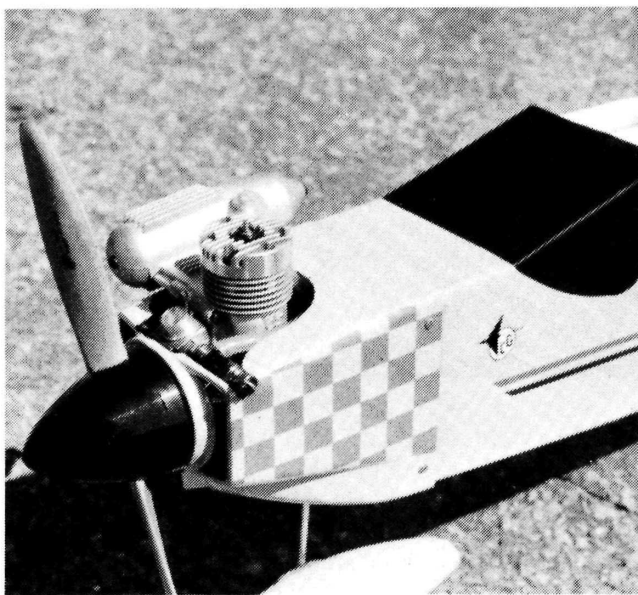


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F-15!

Span 32 in.
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Weight 39 oz.
Will take RK-720





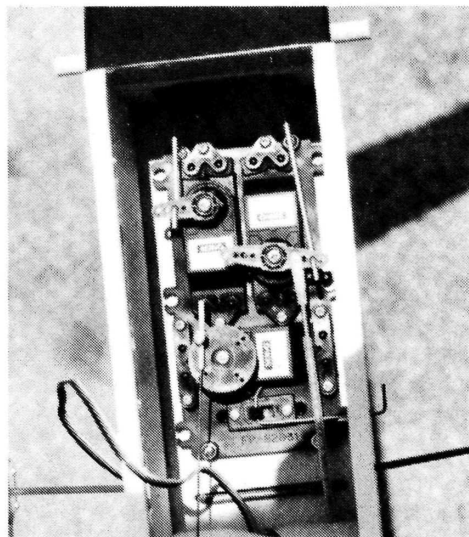
Apparently, no other formers are needed: because the top and bottom of the fuselage are solid pieces of lite-ply, they give the necessary rigidity and take the place of cross-bracing.

Motor-mount construction is next, and you have options. Three mounts can be used (your choice will depend on the engine size you choose), and all the parts are die-cut ply. The mount's side plates have tabs that lock into slots in the firewall, again to avoid misalignment. The motor mount can be permanently glued to the firewall or secured with screws.

WING

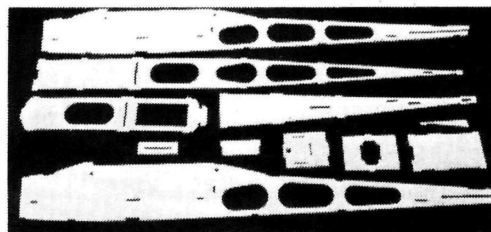
The wing comes next, and because it's flat-bottomed, it's built directly over the plan. Its tapered planform not only looks great, but it also helps to dampen the effects of turbulence and eliminate tip-stalling.

The ribs are of die-cut $\frac{1}{16}$ -inch balsa, and the spars are rugged, but light, basswood. Because the leading edge comes already shaped and the trailing edge is notched, assembly is quick. The design is fully shear-webbed between the ribs (and this increases the overall strength), and the webs are thoughtfully cut to size. The wing's upper surface is sheeted with $\frac{1}{16}$ -inch sheet balsa



Above: There's plenty of room for standard-size servos in the radio compartment. See sidebar for more info on the new Kyosho system shown here.

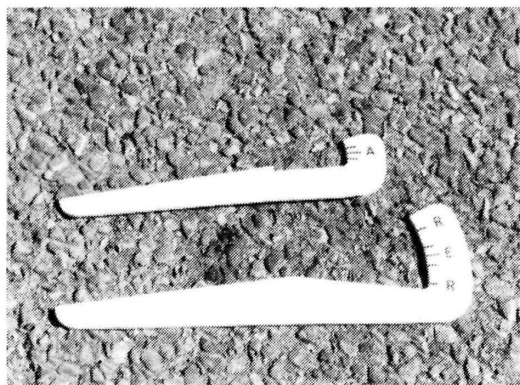
Above left: Spinner adds to the clean look of the Freedom 20, as do the supplied wheel pants, which are just visible in this photo.



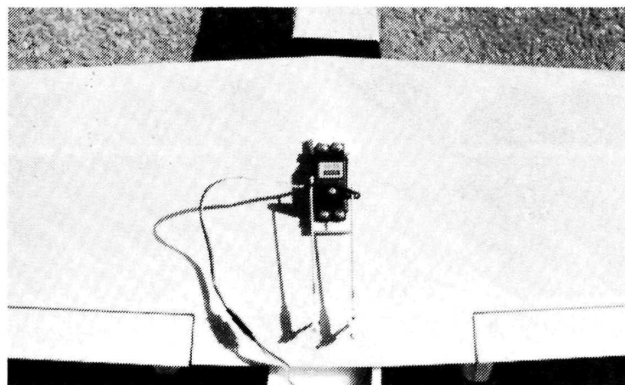
Assemble these lite-ply components, and you'll have a complete fuselage. Clean die-cutting makes construction a cinch.

from the leading edge to the spar, and a $\frac{1}{2}$ -inch-wide strip is used at the trailing edge. Cap strips cover the ribs and connect the leading- and trailing-edge sheeting. Both the top and bottom of the wing's center section are covered with $\frac{1}{16}$ -inch balsa. The strip-type ailerons run nearly the length of the span.

After you've joined the wing halves, add the top center-section sheeting and



This complete kit includes such handy tools as control-surface throw indicators.



Conventional aileron servo is located in wing center section, driving strip ailerons through pushrods.

QUIET FLIGHT

Sailplanes and slope soarers at the show

by JOHN LUPPERGER

I HOPE THAT those of you who joined in the construction of the Project Sophisticated Lady had fun. I'm including a picture so that you can see the finished model. I covered mine with Oracover from Hobby Lobby*. This covering is fast becoming my favorite, because it goes on easily, is strong and works on sheeting like nothing else I've ever used.

As you can see, the model looks like the original design, but changes have been made to strengthen some areas and to enhance handling. The change in the dihedral gives the model a flatter turn, and the addition of spoilers enables it to land more precisely. I hope you enjoy flying the Project Sophisticated Lady and improve your skills with it! If you'd like to see some other model as a "project" plane, drop me a line.

I test-flew the Lady just two hours before my club's monthly contest, and it

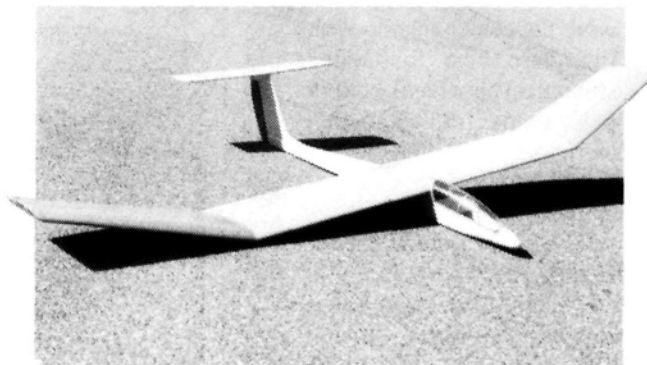
flew right off the board. As a matter of fact, after three rounds, I was tied for first in Open Class! (I entered 2-meter with the same model and did terribly.) When the dust had settled after the fly-off, I had won by about 30 points—not bad for a basic sailplane design!

As a result of the "project" series, I've received several requests for more detailed info on spoilers. For the next issue, I'll prepare a drawing and some photos that will show a simple spoiler installation.

THE SHOW SEASON BEGINS!

Every year, at trade shows around the country, we see the manufacturers' new goods, usually before they're marketed. The first show of the year is the IMS (International Modelers Show), which takes place in early January in Pasadena, CA.

The show's layout seems to improve every year, making it easier to get around and see everything that's on display, and, as usual, there were quite a few new prod-



The Project Sophisticated Lady, covered and ready to go! Although the changes in the wing planform are obvious, the finished "project" model has the overall look of the original.

ucts for those who take their R/C hobby "quietly." I saw new goodies for thermal pilots and sloper and electric enthusiasts. I didn't see everything, though, so any manufacturer I missed should feel free to send me information on new offerings. I'll be happy to let MAN readers in on the news. Here's some of what I did see:

■ Composite Structures Technology*

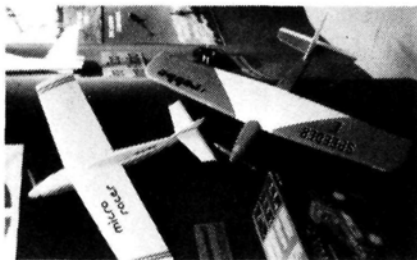
CST showed a nice vacuum-bagging system for those interested in composite building. Finding a decent pump has been a problem for those interested trying vacuum bagging.

The solution?—CST's unit; it's compact and of a high quality, and it comes with a 1-year warranty. The set includes push-in tube fitting, vacuum-line tubing, 16mm bagging vinyl, 4mm bagging vinyl, mold-release spray, bag sealant and vacuum distribution rope. This is such a nice system, I might try it myself!

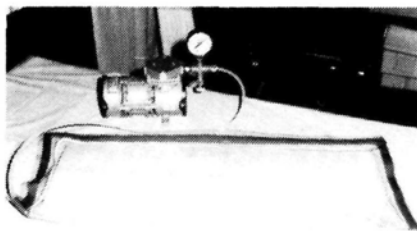
■ Peck-Polymers*

Best known by the free-flight fraternity, Peck-Polymers has recently become involved in R/C and has kitted an interesting flying wing—the Genesis. Originally designed by Keith Schwemmer for hand launching, the Genesis has

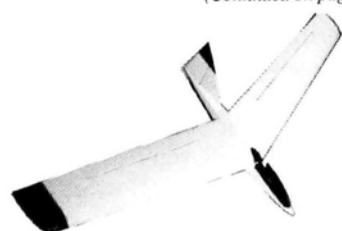
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Robbe's new Micro Racer should help rekindle interest in electric pylon racing. The all-wood kit includes motor, spinner and prop.

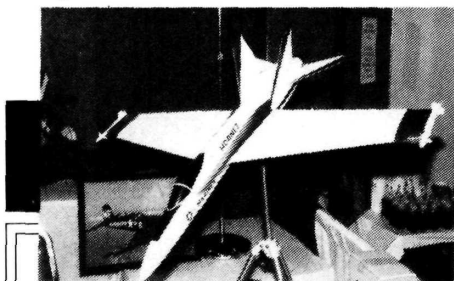


Composite Structures' Vacuum Bagging System is simple, but complete; it has everything you need to try this interesting, new technique.

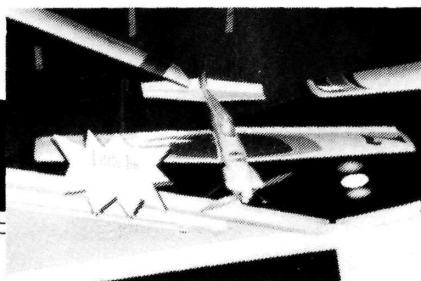


Peck-Polymers' new Genesis flying wing was originally designed as a hand-launch glider. This new kit should find favor with slopers and thermal fliers.

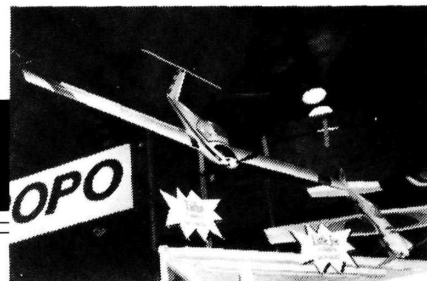
QUIET FLIGHT (Continued from page 54)



No matter how you look at it, Cliff Hanger's new F-18 screams performance! This hot sloper is designed for experienced pilots who want high-speed flight with clean, crisp aerobatics!



Hobby Dynamics' new Little Joe electric ARF looks like a miniature pylon racer. You can also buy this 32.6-inch-span model for "gas" flying.



The Taifun electric ARF motor glider from Hobby Dynamics is small, but should be big on fun!

proven that it's equally at home on the slope or off a high-start. The model spans 59 inches, has a wing area of 346 square inches, weighs 10 to 12 ounces and uses three channels on rudder and elevons. The kit has full-size plans, instructions, hardware, die-cut balsa, plywood and spruce.

■ DCU*

For a couple of years, DCU has been making slope models, which are popular in California. With the knowledge it gained from its Dragonfly series, the company has developed an even smaller model—the Microfly. I had a chance to fly this diminutive sloper, and it was a blast! With a wingspan of 36 inches and a wing area of 144 square inches, the model weighs 11 ounces and requires two channels—aileron and elevator. The kit can be built quickly and has foam-cores, sheeted tail surfaces and a vacu-formed polystyrene fuselage.

Also at the DCU booth was the prototype of its F-14 power scale sloper. Strictly in the developmental stages, the 50-inch-span model weighs 36 ounces and requires two channels (aileron and elevator). The kit will probably have foam-cores and a fiberglass fuselage. I'll keep you informed as things develop.

■ Hobby Dynamics*

Hobby Dynamics now imports two, new, great-looking, electric ARFs from HD Models of Japan. The models' construction resembles that of the well-known "EZ" type of larger gas ARFs. Both use small, electric, 280-type motors and (I think) 450 or 600mAh 6-cell battery packs.

The Little Joe is a mid-wing pylon-racer-type model with a 32.6-inch wingspan and a 178-square-inch wing area, and it weighs only 16 ounces. The Taifun is a low-wing, T-tail rendition of a full-scale motor glider. It spans 51.1 inches, has a wing

area of 260.4 square inches, and weighs 17.5 ounces. Both models should be great for school-yard flying!

■ Glidesigns*

A new company, Glidesigns' first model is the Lance. Designed for slope aerobatics, this model requires only covering and the installation of your radio gear. The wing uses the Selig 3021 airfoil in machined balsa. That's right!—no ribs or foam-cores, just solid balsa. The fuselage is glass and carbon fiber, so it's light and very strong. The model has a wingspan of 48 inches, a wing area of 269 square inches and a wing loading of 11 to 13 ounces to the square foot, and it requires two channels (aileron and elevator).

■ Cliff Hanger Models*

Well known on the West Coast for its Power Scale Slopers (PSS), Cliff Hanger has added a hot new number to its line. I didn't get the specs on the F-18, but most of the models are in the 48-

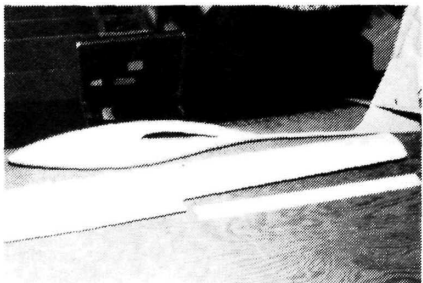
to 50-inch-span range. The F-18 kit includes an extremely rugged fiberglass fuselage, foam-cores and all the necessary wood. It looks "right," and if it flies like Cliff Hanger's other kits, it should be one of the hottest slopers around.

■ VS Sailplanes*

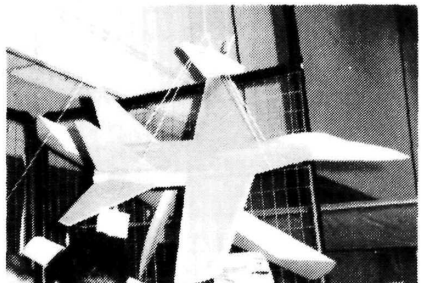
The VS booth was full of many types of pitcheron- and wingeron-controlled sailplanes. The newest prototype that caught my eye was the Zulu, which has lines like those of the F-14 and F-15. The interesting thing about this model is that it's controlled by "tailerons." The stabs are actuated with two servos and controlled by elevon mixing. If you want, you can set up the wings with full-span flaps, which allow this quick model to be slowed to a crawl for easy landings. Sounds interesting!

The model weighs 30 to 35 ounces and requires two

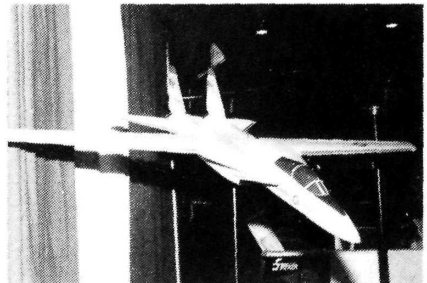
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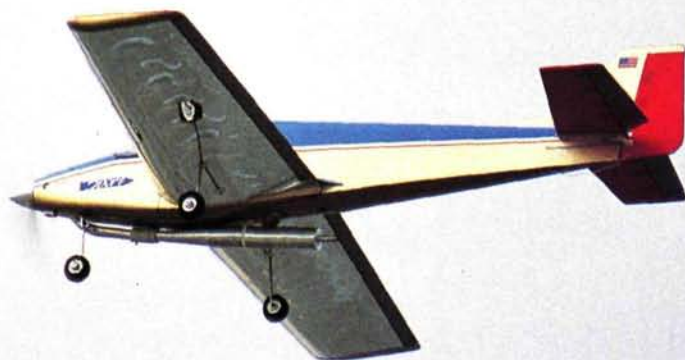
Glidesigns' new, almost-ready-to-cover, ARF sloper—Lance—has machined, solid-balsa wings. The model is light, but it has excellent penetration for hot aerobatics.



VS Sailplanes' new Zulu features "taileron" control with optional full-span flaps. This allows the fast sloper to make slow, controlled landings on slopes.



DCU's new F-14 looks as though it will be a "Top Gun" flier. The model's scale appearance should make it a favorite at the slopes.



by BOB & EARL CARPENTER



SPECIFICATIONS

Type: Sport/pattern

Span: 55 inches

Area: 566 square inches

Weight: 6 pounds

Wing Loading: 24 ounces per square foot

Power Req'd: .40 to .45 2-stroke; .60 to .70 4-stroke

No. of Channels Req'd: 4 (5 with retracts)

Suggested Retail Price: \$109.95

Features: All balsa and ply kit. Computer-generated printed plans and a photo-illustrated construction manual.

Comments: An excellent kit with high-quality materials. Builds well and true, owing to interlocking parts arrangement. Builder may opt for fixed tricycle or tail-dragger gear, as well as tail-dragger retract. Vertical performance with a piped engine is literally out of sight!



THE GREAT PLANES*
Ultra Sport intrigued us from the moment we saw it. The promise of a fully aerobatic, .40-size airplane that was rock-solid in the air was just what we were looking for.

We had just finished building a foam-wing airplane and were sour on that idea, so we placed a great deal of importance on the Ultra Sport's built-up balsa wing. The wing, the box-type fuselage and the extensive instructions

GREAT PLANES MODEL MFG.

ULTRA SPORT 40

- This built-up balsa, sport-pattern
- airplane uses proven components with
- appealing lines. Versatile too!

promised success in putting all the pieces together properly and easily.

ULTRA KIT

Great Planes knows how to package supplies in a logical way. With 11 sub-packs and diagrams identifying the die-cut parts, it's very easy to grasp what's what.

The wood is of extremely good quality, and there are no warped or damaged parts. The instructions are sequenced properly throughout

the entire 48-page instruction book, and the rolled blueprints have no flaws.

The photos are clear, and the edges of each part are outlined and labelled. Convenient check-off boxes help you to keep track of the building sequence.

ULTRA CONSTRUCTION

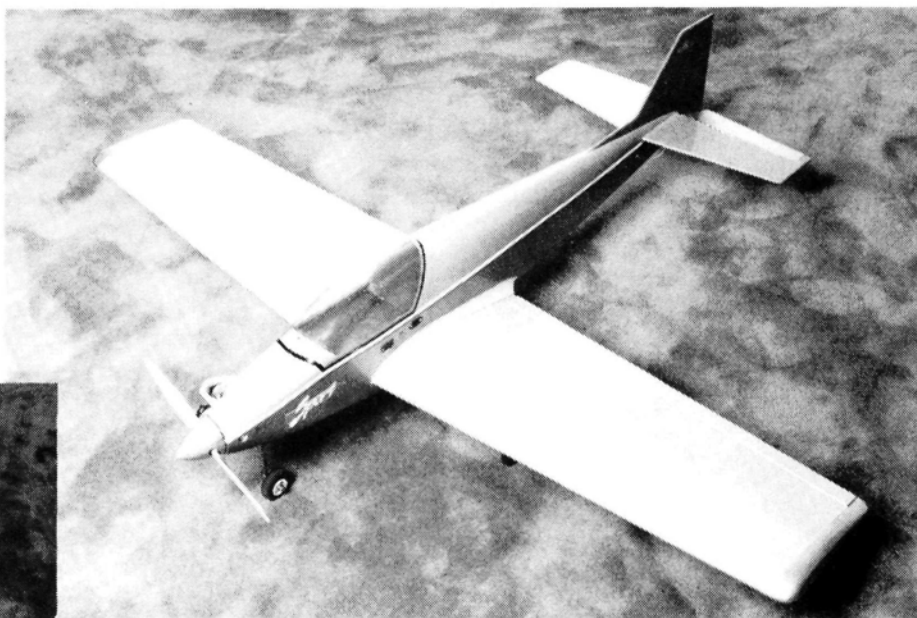
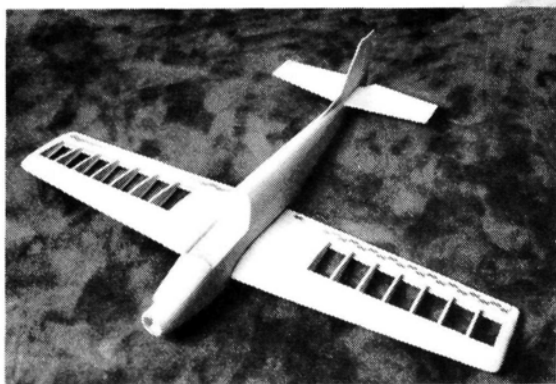
Like many kits, the Ultra Sport starts with the tail feathers.

The vertical stabilizer, the rudder, the horizontal stabilizer

and the elevator are solid balsa. We prefer to build directly on the plans, so we used adhesive spray to stick the plans to a 1/4-inch glass tabletop. Before you start gluing balsa parts down, put wax paper over the plans.



ULTRA SPORT 40



Above: Ready for the runway, the Ultra Sport cuts a sporty profile. There's nothing tricky or unusual about the building process, so if you're interested, get started. Left: Half way through and the kit's already looking sleek. The wood quality was exceptional; there was no need to replace anything supplied in the kit.

The wing panels are next on the building list, and we were very impressed with the insightful tips in the instructions. An example: "Before using the $\frac{1}{4} \times \frac{3}{8} \times 27\frac{1}{4}$ -inch hard balsa spars, examine them carefully for possible imperfections. Look for knots, soft spots, diagonal grain and any other imper-

fections. If possible, position each spar so the imperfections (if any) are on the outer half of the wing panel (toward the tip), where they will be least affected by high stress. If the spars are warped slightly, try to 'balance them out' by installing the warped spars in opposite directions."

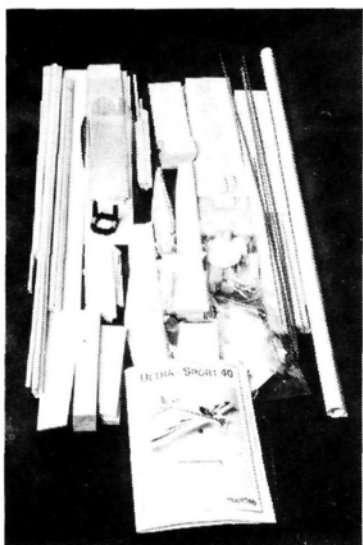
Complete instructions are

provided for setting up the Ultra Sport either with tricycle landing gear or as a tail-dragger. There isn't enough room for retracts in the plane's nose, so they can only be used with the tail-dragger setup.

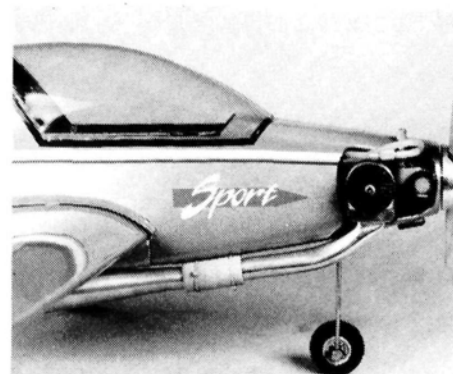
For inexperienced builders, the plans explicitly detail the proper method for joining the wing halves with fiberglass, but the instructions point out that experienced builders should feel free to use their favorite method.

The fuselage is a straightforward box design, and the instructions offer plenty of help with the choice of an engine mount for various types and sizes of engine. The turtle-deck construction is explained well, and anyone who has built a trainer competently can do a fine job.

Great Planes gives the builder the option of installing wing fillets (although the plane flies well without them), but the improvement in looks made them a necessity in our eyes.



The Great Planes kit is complete and intelligently packaged. The rolled plans and instruction manual clearly spell out what the builder needs to do.



The Futaba YS45 pumper engine and the M tuned pipe and header. If you're going to buy fast airplane, you might as well go all the way.

The canopy is expertly crafted, and very little trimming is necessary. The instruction book even offers a recommended covering sequence. It took six, 8-hour sessions to get the plane ready to fly (about average for us).

Instead of insisting on an absolute balance point for the Ultra Sport, Great Planes recommends that you try several flights with the CG 4 inches back from the leading edge. After that, you can move the balance point $\frac{3}{8}$ inch forward for more stability (although this might make the plane handle sluggishly and require more speed on takeoff and landing) or $\frac{3}{8}$ inch back for more agility when snap-rolling or flying in a knife-edge.

ULTRA PERFORMANCE

The Ultra Sport lives up to its promise of great agility with handling that's super-

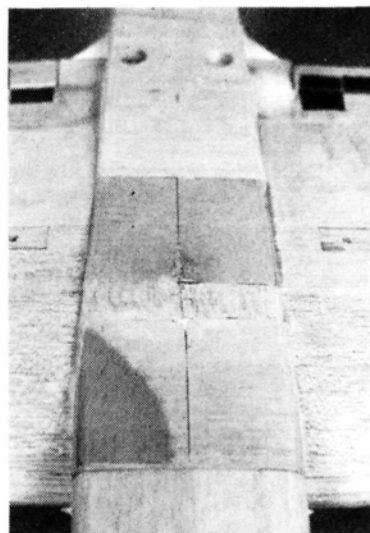
competent with their flying skills.

We were able to duplicate every flying maneuver in the book, and, although we won't be winning any prizes for *our* competence, the plane's stable habits helped to build our confidence.

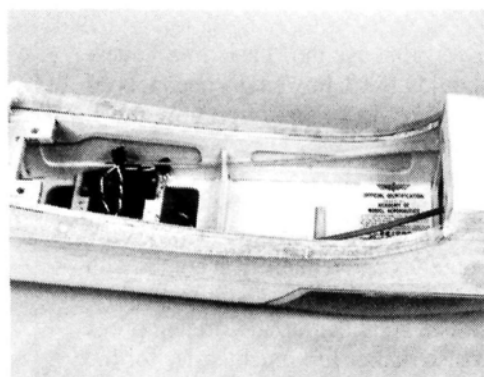
We used a Futaba* YS45 pumper engine with a Mac's* head pipe and tuned pipe on the plane. We can't say enough about the performance, reliability and value of this engine. With this engine setup, the airplane's vertical capabilities are phenomenal. We were able to go straight up—without as much as a whim-

plane up with the runway, cut power and steer it in for stellar landings and touch-and-gos. The Ultra Sport will go into a full-stall landing without the danger of a tip-stall, so there's plenty of leeway for experimentation.

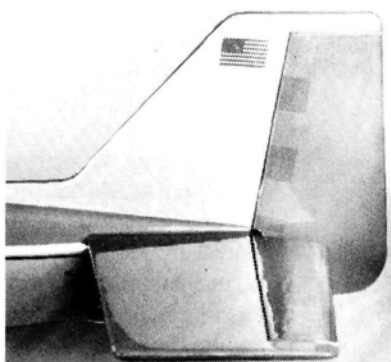
With the amount of stability built into the airplane, pilots just getting into the intermediate level can push themselves to new limits without the risk of getting in over their heads. The Great Planes Ultra Sport is everything it claims to be—and more!



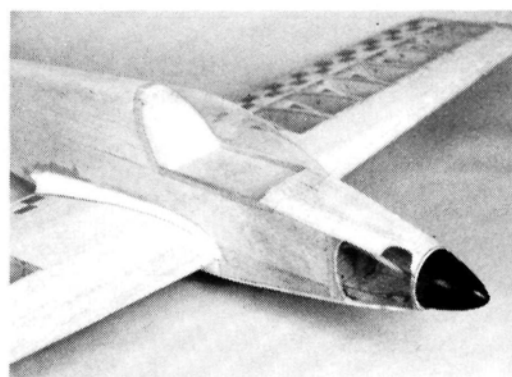
If you decide to include wing fillets, you'll be rewarded with a snug-fitting, sharp-looking wing/fuselage junction.



With the fuselage on its back, you can see that there's a cavernous area available to fit the battery and all the radio equipment.



The super-strong tail feathers are made of solid balsa. Gapless hinges ensure strength and better performance.



Check out the smooth lines of the cowling: it's as close to art as a model airplane is going to get. Very little trimming was needed to fit our engine.

stable and predictable. Make no mistake, however: the Ultra Sport's capabilities are far beyond those of a trainer. It doesn't have the self-recovery traits of a flat-bottom, dihedral-laden wing, so before attempting to wring-out this airplane, pilots must feel

per—until the Ultra Sport was out of sight!

The manual suggests that landings are best when approached low and shallow: the Ultra Sport likes to float so much that it can be difficult to make it drop to the deck. We merely line the

**Here are the addresses of the companies mentioned in this article:*
Great Planes Model Manufacturing, P.O. Box 788, Urbana, IL 61801.
Futaba, 4 Studebaker, Irvine, CA 92718.
Mac's Products, 7935A Carlton Rd., Sacramento, CA 95826. ■

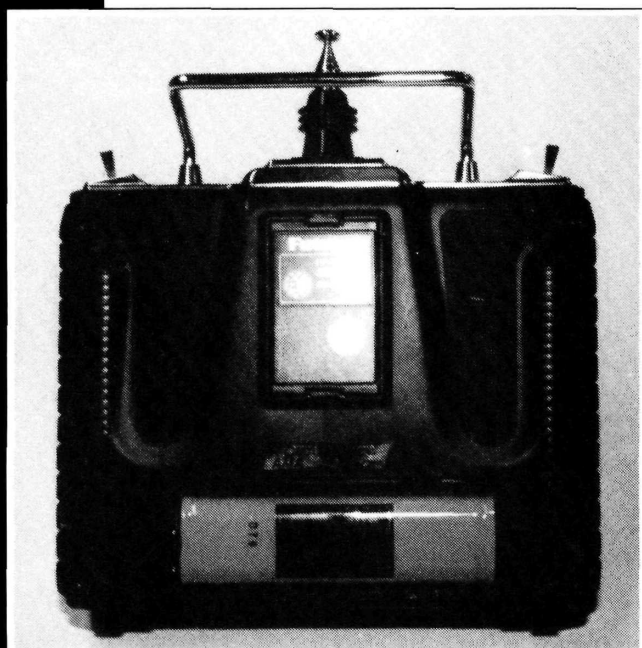
FUTABA FP-5UAF

No bells, whistles,
buzzers, or chimes—
just a darned
good radio!

by WALLY ZOBER



The system's major components, right out of the box. If you plan to use the fifth channel, you'll have to buy an extra servo.



The rear of the transmitter. The rectangular object at the center is the plug-in frequency module. The battery compartment cover has been removed to expose the 9.6V pack.

PHOTOS BY WALLY ZOBER

NEWCOMERS TO R/C often ask the “basic four” questions: which radio should I buy?; how many channels do I need?; how many servos do I need?; and how much should I spend?

Although there are no pat answers, this is what I'd tell them.

● **Which radio?** I'd recommend the Futaba* FP-5UAF (FM) system. This high-quality, 1991, narrow-band system offers the latest in state-of-the-art technology and reliability. It comes with four standard-size servos (S-148) and features a built-in “buddy-box” trainer system, which is a great help to the student pilots while they learn to fly. (It also makes life much easier for the flight instructor.)

● **How many channels?** Five channels is the minimum amount I recommend for a simple reason. When you become a proficient flier, you'll want a more sophisticated R/C model—perhaps a pattern airplane with retracts, or a sport scale model with a bomb-drop mechanism, or you may decide to tow R/C gliders aloft. For any of these functions, you need the fifth channel (and servo) for your auxiliary control.

● **How many servos?** If you buy a 5-channel R/C system, you should also buy the fifth servo. Although most standard trainers only need four channels, that fifth channel and servo will



The plug-in frequency module enables you to change frequency as desired; just remember to change the receiver crystal at the same time.

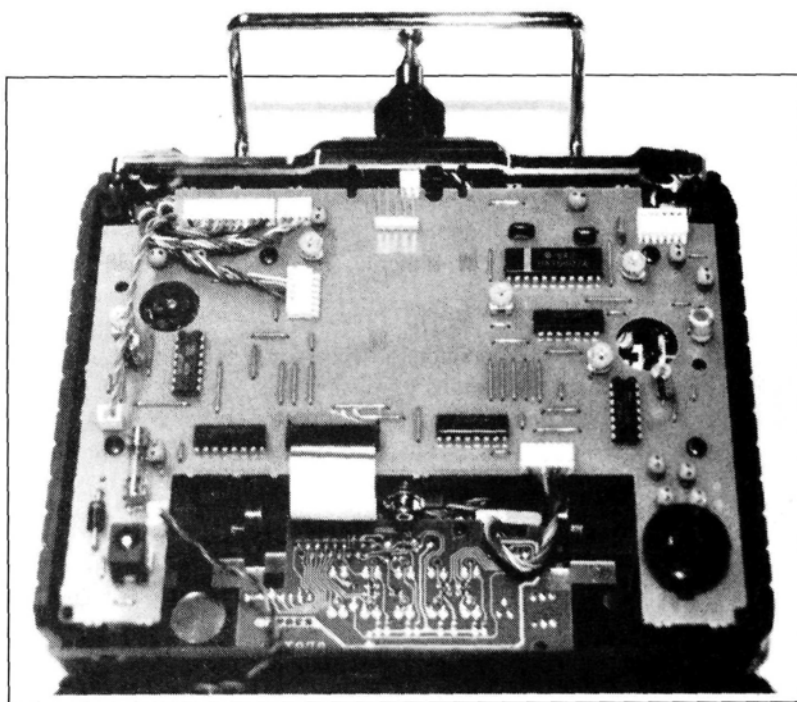
have many applications when you've broadened your R/C flying interest. It never hurts to have an extra servo around when you're learning to fly, either.

● **How much to spend?** The Futaba FP-5UAF is reasonably priced, and it will appeal to serious modelers, sport fliers and newcomers. Given Futaba's reputation for quality, it certainly seems like a sound investment.

Now for some technical data on this system—nothing heavy, just some basic information to let you know what's in the box.

TRANSMITTER

The FP-T5UAF transmitter is supplied in a dual-stick, Mode II configuration (left stick—throttle/rudder; right stick—elevator/aileron), and it's also available in a Mode I configura-



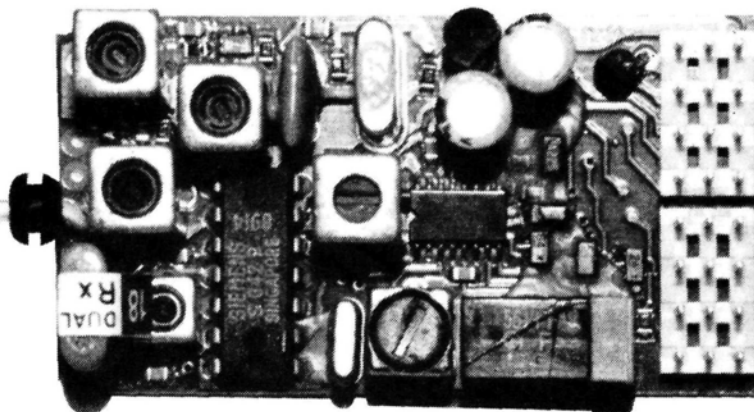
Removing the back of the transmitter case reveals tidy boards, low parts count with mostly IC chips.

aileron; adjustable throttle limiter (ATV) for throttle; servo-reversing switches on all five channels; and an integrated trainer system.

The control sticks have spring-tension adjustable capabilities and a non-slip, adjustable, stick lever head. There's also a neck-strap bracket and easy-to-read square level meter (transmitter battery voltage/RF indicator). The transmitter is fairly light, and the transmitter case has molded grips that make it very comfortable to hold.

The fifth-channel toggle switch on the upper left of the transmitter case is positioned for easy fingertip actuation. A spring-loaded trainer-enabled switch is on the upper top right side of the case, and the dual rate switches are conveniently located on the upper face of the transmitter. The on/off power switch is at the center of the transmitter; just below that is a panel that covers the adjustable travel volume (ATV) potentiometers for each channel (except channel 5) and also houses the servo-reversing switches.

I ran a simple discharge test on my transmitter and airborne battery packs. After initial charging for at least fifteen hours (as the instructions recommend), I flew the system in my .60-size Sweet Stick four times, recharging the system each time for a minimum of 14 to 15 hours. The transmitter, receiver, servos and batteries performed flawlessly.



Inside view of the receiver—densely populated board but compact design.

tion. It's powered by a 9.6V, 500mA battery pack, and current drain is 200mA. It features an RF module, desirable dual rates on elevator and

aileron; adjustable throttle limiter (ATV) for throttle; servo-reversing switches on all five channels; and an integrated trainer system.

To check the range of the system, I collapsed the antenna so that it protruded approximately 1½ inches from the transmitter case. I set my airplane on my flight box so it was approximately 3½ feet above the ground, and I walked 35 feet away from the model. Everything operated as though the antenna was fully extended.

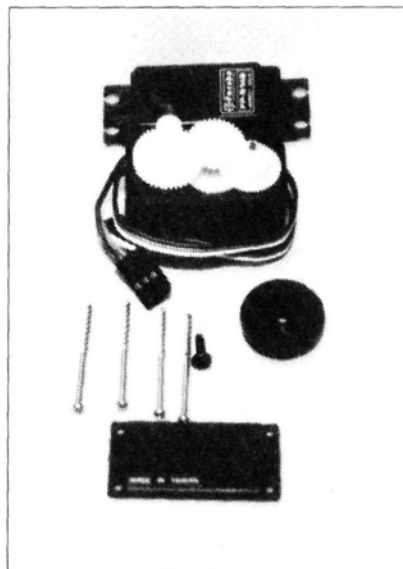
When I got home, I recharged the system and put it on my battery cycler. The transmitter pack and the airborne pack each ran 165 minutes. Checking this radio against my other radios, I found it to be on par with them.

RECEIVER

The Futaba R128DF dual-conversion receiver measures 1.39x2.51x0.82 inches and weighs 1.3 ounces. It's powered by a 4.8V Ni-Cd battery (which is shared with the servos), and its current draw is 26mA. The receiver is the "brain" of the R/C airplane: it receives information from your transmitter, interprets it and then sends the information or commands to the servos, which provide the muscle to move the control surfaces.

BATTERY

If the receiver is the "brain" of your R/C airplane, the airborne battery pack is the "heart." If your battery fails, it's as if your plane is suffering from massive cardiac arrest, and it will succumb to a terrible crash. That's why it's important



The top of the servo has been removed to show sturdy, nylon gear train. Unless you feel comfortable doing it yourself, send it off with the case closed for any required service.

to check your battery periodically, charge and discharge (cycle) it properly and, yes, occasionally replace it. This system comes with a 4.8V, 500mA battery pack.

SERVOES & ACCESSORIES

The Futaba FPS-148 is a precision servo of moderate size and weight. Each one measures 1.59x.77x1.58 inches and weighs 1.5 ounces. Torque is a strong 42 ounce-inches, and transit time is .22 second/60 degrees. These servos share the receiver's 4.8V and draw an idle current of 8mA at 6V.

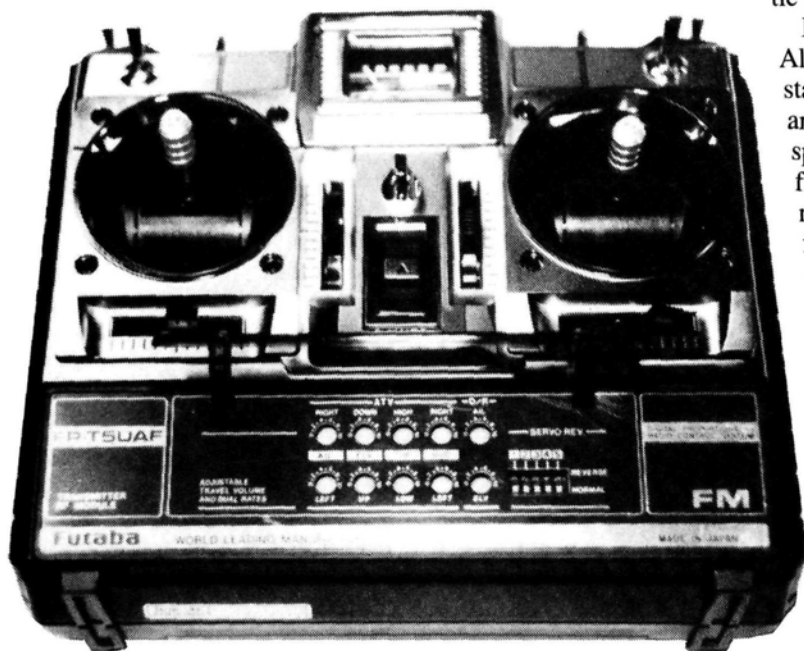
The system comes with neck strap, servo tray, aileron servo tray, frequency flag, red streamer, and four plastic bags filled with output arms and hardware.

I'd like to make a comment about frequency flags. Almost every R/C club I know of has prescribed flight stations on which the pilots stand when flying. These are usually concrete slabs or patio blocks that are spaced 30 to 40 feet apart. Standing at one of these flight stations, it's difficult to read the frequency numbers on the antenna-mounted flags. I strongly feel that we should go back to the colored streamers frequency flag. They're much easier to see, even at great distances. At the Lake Havasu Schneider Cup Race Reenactment, frequency conflict caused the crash of a beautiful racer. Using colored flags to identify channels could have prevented this. Enough said—let's think about it!

I'm very satisfied with the performance and quality of my new Futaba. Although I'm not a beginner, I'd have no reservation about recommending it, and when answering a newcomer's "basic four questions," I conclude by saying, "It's a darned good radio!"

**Here's the address of the company featured in this article:*

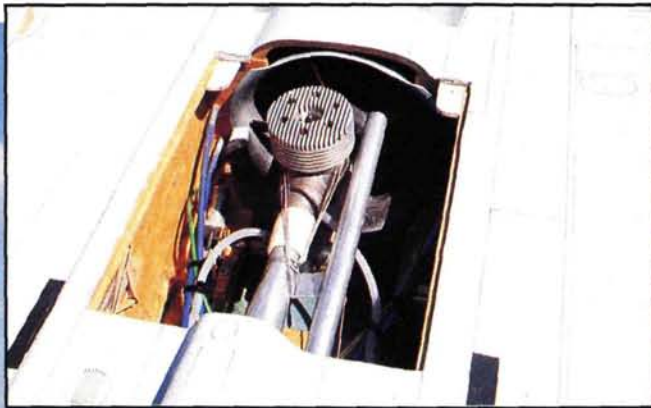
Futaba Corp., 4 Studebaker, Irvine, CA 92718.



Transmitter's lower front face houses servo-reversing switches, dual-rate and end-point adjustments on four primary channels. Plastic panel keeps out dirt.

No need to be intimidated any longer by ducted fans. This one flies nicely and uses traditional construction materials.

EKTACHROMES BY RICH URAVITCH



BOB PARKINSON MODELS
R E G A L

EAGLE

by PAUL GRADY & RICH URAVITCH



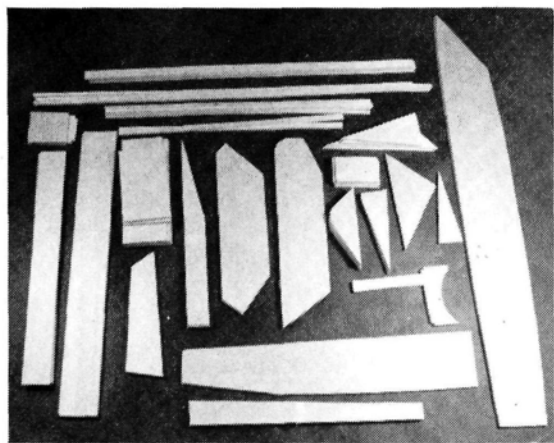
This product review is unusual in that the flight evaluation wasn't made by the author. With the plane almost built, Paul Grady found that he wouldn't be able to finish and fly it, so he turned it over to me for the final effort. It arrived as an ARC model (Almost-Ready-to-Cover), and I think it would be really great if we could buy it just that way!!

Rich Uravitch

THE "UGLY STIK of ducted fans?" Far from being derogatory, that title actually confers more than just a little distinction. More

clones have spilled from the original Stik than from any other plane, and it has been in every modeler's hangar at one time or another. The

Regal Eagle now gives Bob Parkinson Models* reason to claim that distinguished title and, as a candidate for the role, the Eagle has



These balsa and ply parts are included in the kit. Quality of wood was fair to good; cutting accuracy acceptable.

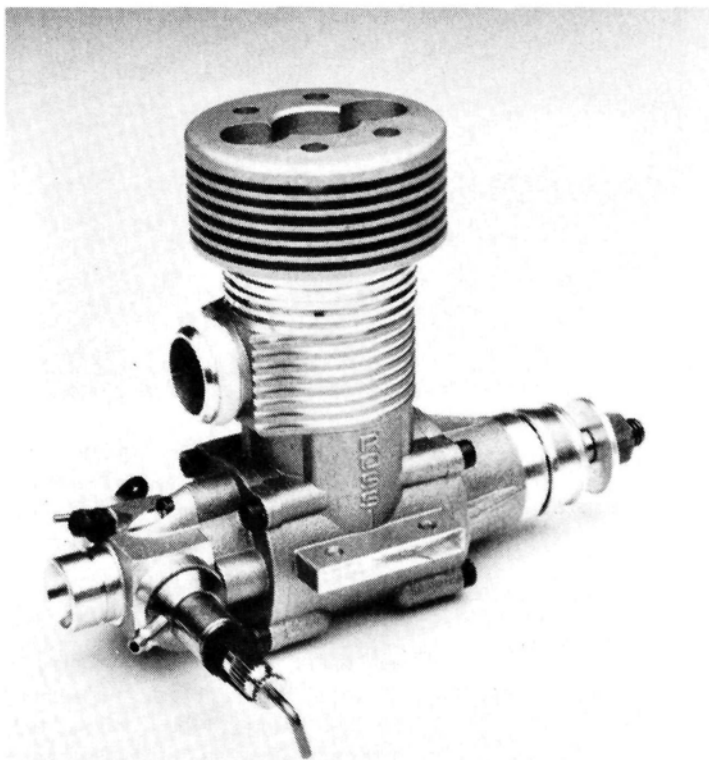
many strong points—but also some disappointing ones.

Like the Ugly Stik, the Eagle is simplicity itself for a ducted-fan plane: almost no internal ducting (just a simple thrust tube); essentially a box fuselage; and an excess of thrust over weight with the inexpensive, proven Byro-Jet* to help get the plane rolling—even on a fairly rough field. As well as this, the kit is almost all wood, and most sport modelers still prefer that.

A CLOSER LOOK

Well over 70 percent of this kit is pre-cut balsa and ply. Since jets look as though they have curves in all the right places, the Regal Eagle relies on two major fiberglass pieces to avoid looking like a "square" jet. In the fuselage, curved fiberglass pans are glued onto the upper and lower rear centers to add some F-15 realism without increasing the work involved. The foam-core wings have two alignment holes that set the wing incidence.

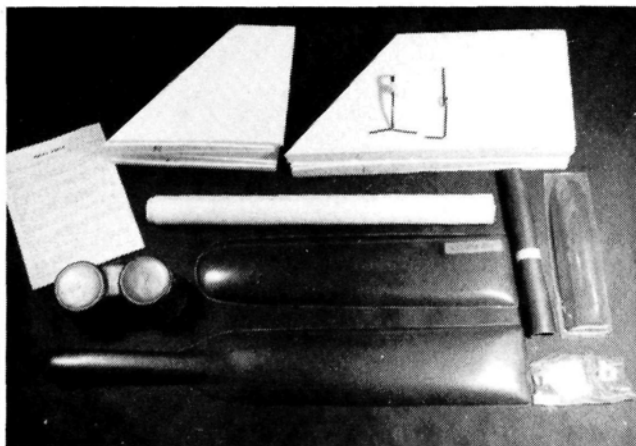
The rest of the plane is wood, and many of the parts have been cut to shape. The plane's designers



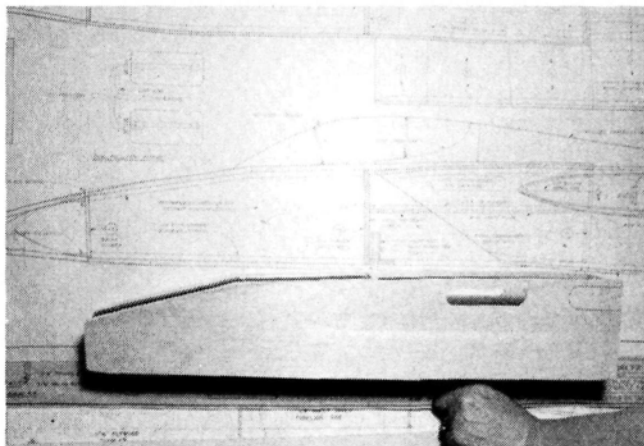
Although original flights were performed with the now-out-of-production Rossi .81, it will soon be replaced by the powerful new .91—impressive piece of hardware!

aimed to make critical alignments as easy as possible to achieve, so the wooden fuselage sides come drilled with 1/4-inch holes. These give the accurate locations for the bulkhead/stub spars that carry the load of the wings and the Byro-Jet, for the wing-incidence alignment pegs; and for the critical horizontal stabilizers.

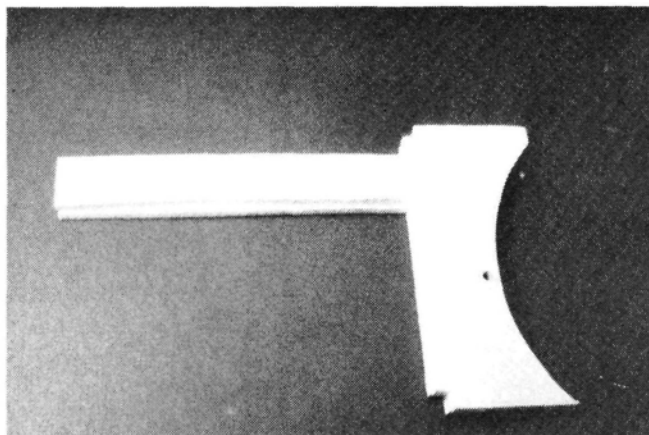
With the exception of the leading-edge stock, some of the strip stock, and some of the upper and lower fuselage-sheeting stock, the other wooden parts are also cut to shape. I soon noticed the absence of balsa sheeting stock for the wing. Parkinson Models offers an optional, fiberglass, wing-sheeting product called "Ultra-glass," but to keep down weight, I chose the



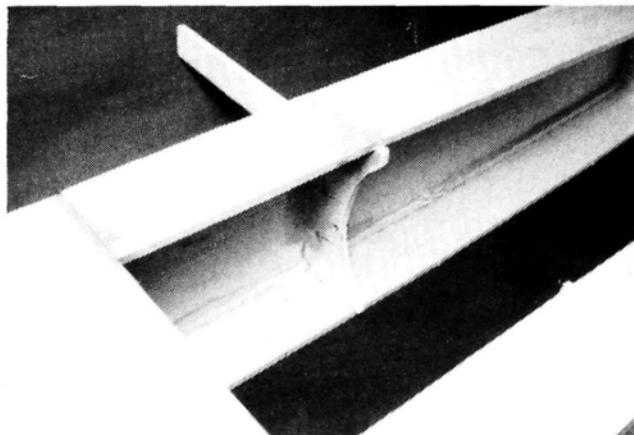
The rest of the kit parts, including the cut-foam wing cores, fiberglass cosmetic components, instruction manual and blue-line plans.



The forward fuselage builds up as a sub-assembly box that's then joined to the main airframe. The additional, balsa triangle stock that's installed to allow the nose to be carved to a more rounded, scale-like shape isn't visible. Holes are for tuned-pipe cooling.



Above left: Here's an example of the cutting inconsistency found in the review kit. These lite-ply (poplar) formers were replaced by five-ply birch cut to the outline of the lower part in photo.



Above right: Early phase of construction showing fan bulkhead installed. This joint should be carefully made as it provides connection to wing panel.

more traditional balsa sheeting.

To complete the kit, the hardware package contains hinges, bent $5/32$ music wire for fixed landing gear, aileron torque rods, a clear plastic canopy, plans and a set of building instructions.

THE BAD NEWS...

Although the Eagle's design is excellent, the quality of some of the wood and the lack of symmetry of some of the matching parts partially dampened my enthusiasm for the kit. Since the plans aren't exactly full size (the plane isn't built on them), I was initially concerned about the match of the parts, and I

wondered which were accurate. The critical alignment holes had, however, been accurately drilled, and some "dressing" of the parts brought them up to par. Carefully check that the fuselage sides, the horizontal and vertical stab pieces, and the control surfaces match one another before you start construction. You should also identify each part (especially strip stock), since no dimensions are given on the plans or in the instructions.

GETTING IT TOGETHER

Bob Parkinson claims that the key to making a straight Regal Eagle is the square as-



Prepping the Regal Eagle for a grass-field hop, Lynn Stevens takes a long, loving look at it, unsure of what to expect! Blue Hornet in foreground.

The occasion was the Chicago RCHTA show of two years ago. You meet a lot of people at these events, and most like to talk. So, there I was at the Air Age booth, dutifully handing out magazines, drumming up new contributors and really enjoying myself.

A big guy arrived and said, "Hi Rich, I'm Lynn Stevens; I read 'Jet Blast' and really enjoy ducted fans. Can you get away for a couple of hours?" Well, I'm the adventurous type, so we headed off for a 20-minute ride to his club field—wall to wall grass.

Once there, Lynn showed me his camouflaged Regal Eagle and blue-and-white Blue Hornet, and, while we talked, he fueled up the Eagle and got ready to fire-up. I surveyed the scene,

the transmitter was thrust into my hands. This comparative stranger was actually inviting me to fly his jet! This isn't quite as unnerving as the Eskimo tradition we've all heard about, but it's running a really close second! It seems that if you write about R/C airplanes, people assume you're an expert! (That must be a problem for the editor of a soldier-of-fortune type magazine!)

Not wanting to turn down the offer and risk offending my host (or, worse yet, blow the image), I anxiously advanced the throttle and taxied out to the runway. By this time, the word was out that I'm "with" one of the model magazines and the R/C eyes of Chicago seemed to be watching.

With full power, the Eagle acceler-

Regal Eagles and Eskimo Women

by RICH URAVITCH

noticing the other modelers, who were obviously wondering who this stranger was, at their field, in a business suit.

My thoughts were interrupted by the sound of an engine firing-up, and then

ated, got light, took a little bounce and was airborne. It handled so smoothly that it made me look a lot smoother than I really am. I did a couple of laps for trim and then some

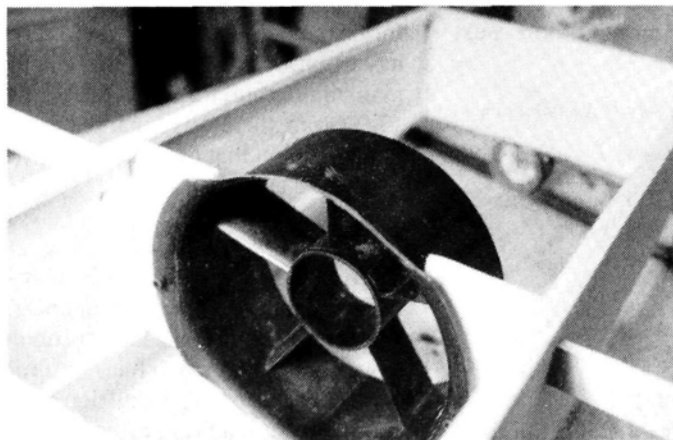
low-level work, and after a few minutes, Lynn advised me to watch the fuel and to set up for a landing. Relieved, I touched down

safely and taxied back. Lynn then repeated the performance—first with the Eagle then with the Blue Hornet.

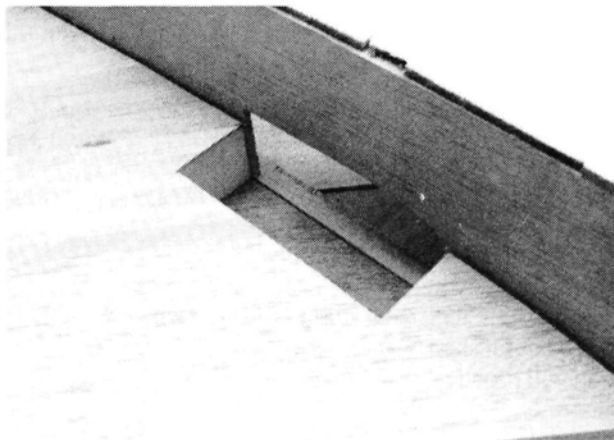
On the flight home, I realized how tight a group R/Cers really are. Lynn and I have become friends, and, after careful consideration, I still prefer flying to the Eskimo's offer!



Eyes skyward as Lynn's Regal Eagle comes smoking by.



Above left: Shroud of Byro-Jet fan unit is modified according to instructions to allow installation in fuselage. Unit is bolted between two bulkhead parts and becomes structural member.



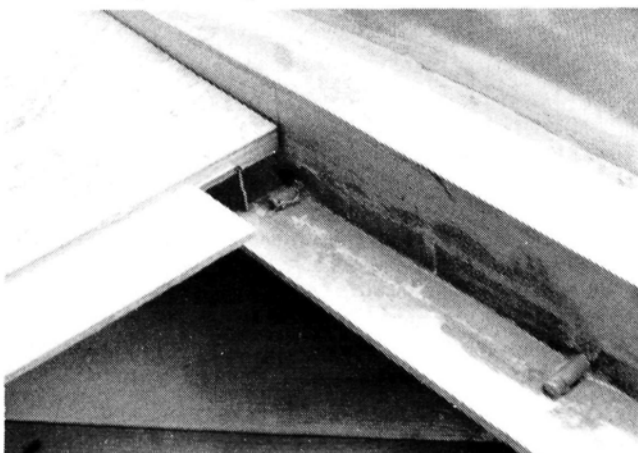
Above right: This cutout in lower wing skin and foam-core forms compartment for one of the two fuel tanks used. Other wing is similar; both openings will be covered by wing-root fairing.

sembly of the main fuselage box—and he's right. This box sets the alignment of the wings and tail surfaces. Get *that* wrong and everything else will be wrong. It isn't difficult; just do it carefully and everything else will fall into line. Although adequate, the instructions will be more meaningful if you can also watch the Parkinson Regal Eagle construction video.

You *must* glass some of the critical joints. Since it takes practically all the aerodynamic load of the plane, the fan bulkhead/wing-stub-spar ply former should be glassed fore and aft on the fuselage with 6-ounce glass-cloth. You might also have to substitute a better grade of plywood for this important part. (Some of the earlier Eagle kits included a three-ply part that was somewhat suspect.) On each side of the rear fuselage, the boxes that provide a base for attaching the horizontal stabs must be glassed into place for strength.

WINGING IT

It isn't difficult to attach the wings. Before sheeting the cores, cut a slot for the stub spar. When the wings have been sheeted, they slide right onto the spars, and alignment pegs set the 0-degree wing incidence. The wing-to-fuselage joint is another candidate for glassing to ensure adequate strength.



To provide additional strength, strips of fiberglass cloth are added to the joint just aft of the wing. Dowels ensure accurate alignment.

Also to increase strength, I substituted a beefier set of aileron torque rods for the kit's 1/16-inch set. Although those provided would probably have been all right for a slower sport model, I wanted extra insurance against flutter.

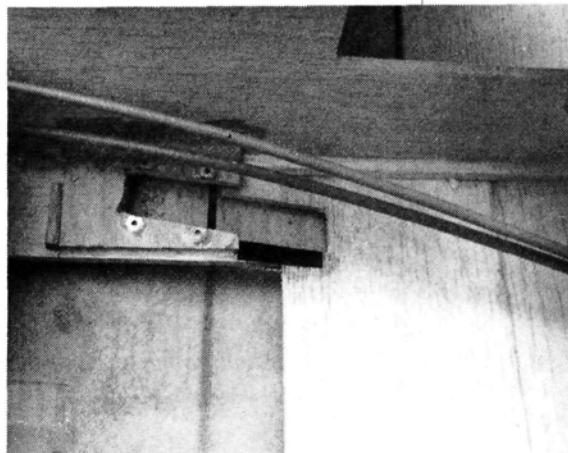
RADIO INSTALLATION

In many ducted fans, the radio equipment is spread out, but in the Eagle, everything is housed in one compartment in the nose section. In keeping with the plane's simple design, the nose section is built separately and then centered, glued and glassed to the front of the main fuselage box. The radio is easily accessible; you don't have to dig through the entire fuselage when looking for a single servo.

DRESSING IT UP

The Regal Eagle looks pretty good, but I was tempted to help it look more like the F-15 Eagle than a Regal Eagle, and without too much extra work, I did it. The main modifications are to the nose and the intake area. First, the nose-section sides must be cut at a steeper angle forward of the canopy, and the nose should be more rounded than that shown in the stock kit instructions. For this, you'll have to substitute some 1/2-inch triangular stock for the square strip stock in the nose.

(Continued on page 114)



Left retract-plate installation. Carbon-fiber strip (dark rectangle) added for strength, along with a layer of fiberglass cloth over the entire area. Nyrod conduits for aileron and elevator pushrods.

GIANT STEPS

(Continued from page 24)

firewall and the tail post; then I shrink the cloth with an iron or hair dryer. Ceconite shrinks approximately 25 percent, so it forms a very tight skin.

Obviously, a model must be carefully prepared before it's covered, because any surface irregularities will show through the covering. Careful shaping and meticulous sanding will produce a good-looking surface.

When the cloth has shrunk as much as possible, I use acetone to seal it thoroughly to the underlying structure. When it's fully sealed, I cut any necessary openings with a sharp knife. This is a quick, relatively easy, very inexpensive method of producing a superbly covered model. A little practice and careful measuring are all it takes.

I use the same method to cover fully sheeted assemblies, and I'm convinced that shrinking the cloth before you actually fasten it to the structure increases strength. The cloth is very strong and, when it adheres tightly to sheeting, it makes the sheeting that much stronger.

That's it for this month. More next time.

*Here are the addresses of the companies mentioned in this article:

Vailly Aviation, 18 Oakdale Ave., Farmingville, NY 11738.

ViP Publishers, P.O. Box 16103, Colorado Springs, CO 80935. ■

ENYA .80

(Continued from page 35)

TEST 1.

Open exhaust. Fuel—10 percent nitromethane with 20 percent castor oil; methanol. Plug—Enya no. 3.

Enya recommends fuel from 0- to 20-percent nitro with 20 percent oil—either castor or synthetic. I recorded a high torque of 169 ounce inches at 10,880rpm, with an hp maximum of 2.31 appearing at 15,722rpm (slightly above the reported—conservative—claims of 2.2hp).

The ability to operate at a full throttle (3,701rpm) was noteworthy, and a significant torque of 114 ounce inches was generated, even at that unusually low point. Air velocity through the carburetor was marginally slow at this low rpm, and any

further reduction in speed would certainly have required some throttle closure to maintain carburetor air velocity. Above 17,000rpm, there was a marked reduction in torque, and that brought this particular part of the test to a close.

TEST 2.

Enya muffler. Fuel/plug as in Test 1.

The 10mm muffler outlet diameter is a fair restriction for this 12.6cc engine, so reductions in torque and fuel consumption were significant. The muffler certainly chops off top-end horsepower, but even so, at 1.84hp, the .80 XF is as powerful in its effective muffler format as most .60-size engines in unrestricted open-exhaust form.

Propellers from 13x6 to 15x8 are appropriate when the muffler is fitted. There's certainly no point in exceeding 13,000 ground rpm, which the 11x7½ Airflow just does.

The back-pressure muffler represses maximum torque to a still-significant 152 ounce inches at the (also reduced) rpm of 9,839. At this point, a considerable horsepower of 1.55 is still, nevertheless, being

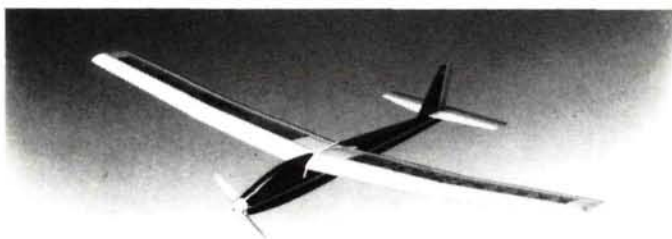
(Continued on page 80)

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Caring for PARTS

by DAVID A. RAMSEY

IN OUR HOBBY, we use an increasing number of nylon and glass-filled-nylon parts. The cost savings of mass-producing injection-molded parts over individually machining metal ones is substantial.

The bad news?—nylon parts can break, and to understand why, you have to know how injection-molded parts are made. Briefly, to obtain a perfect part (i.e., one that will function as it was designed to) by using this process, many conditions must be met: mold temperature, material temperature, material feed pressure, mold cooling and a host of other factors can all affect the result.

There are two primary reasons for the failure of injection-molded parts:

- The first involves internal defects—voids (pockets of air) and material con-

venient on the surface; it looks like a spot that won't rub off. Unless this seems to be a pigment discoloration, I wouldn't use a prop that looks discolored.

- **Voids** occur most often in the thick areas of a part, such as the prop hub. I once noticed a very obvious void inside a prop-hub hole for the engine shaft. To check for voids that might not be visible, push against the hub plastic with a blunt instrument (e.g., a ball-point pen) to look for areas that might "give" under pressure. Discard any prop that's suspect.

MOLD STRESS?!

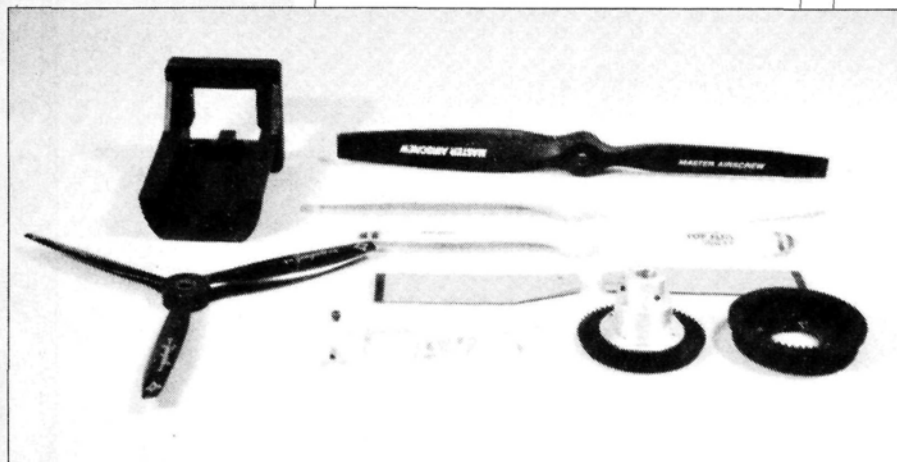
Like a case-hardened metal one, the surface of an injection-molded part is hard, but the inside is softer. As an example, consider the "tree" from a plastic model kit. When you break off a part, the surface of the tree cracks, while the inside seems stringy. For parts subjected to light loads, this isn't a problem, but even normal mold stress can cause part failure during over-stress—crash damage!

STRESS RELIEF

Aging is a natural way to alleviate mold stress: buy some props and let them sit for a year or so in a cool, damp, dark place. Another way is to boil the prop in water. Boiling softens the exterior and makes the entire prop more flexible. (The same is true for glass-filled nylon props.)

I tested the idea years ago when a friend suggested that nylon props were safer after they had been boiled. I bought two 10x6-inch, all-nylon props, and I left one in the freezer overnight. I removed it and immediately flexed it into the shape of a "U"; it broke at the hub. I boiled the other prop for an hour before putting it into the freezer. The next morning, the same flexing didn't break the prop. I again froze it overnight, but it still wouldn't break! Since then, I've boiled all my nylon props before using them. I've also found that boiling glass-filled nylon helicopter gears and landing-gear struts increases their strength.

Here's an example that shows how natural aging yields a stronger nylon



Today, a wide variety of molded products is used in all areas of the R/C hobby.

All molded parts are not created equal, but they all require care

tamination—which can occur during injection molding. These are probably the causes of nylon prop failures when the only stress is that of a normal operating load.

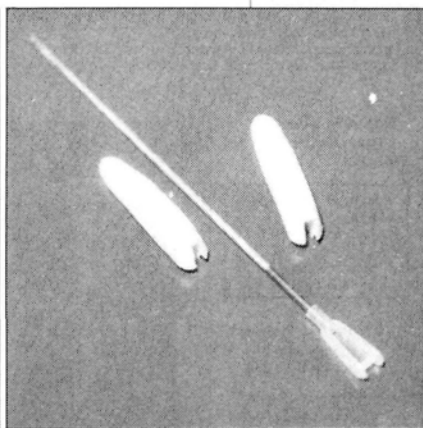
- The second problem—what I call "mold stress"—is caused by the injection-molding process and can't be avoided.

Although the following tips are applicable to *all* nylon parts, I'll refer to nylon props most frequently, because if these break under stress, disaster results. Are they safe?—they *can* be. Read on!

AVOID THE VOID!

The best way to find internal problems is by X-ray, but for us, a visual examination will have to do. Unfortunately, these problems are very difficult to detect with the naked eye. The part might *look* perfect.

- **Material contamination** may only be



Left: Control linkages and the clevises at the ends of pushrods can benefit from stress-relief.

Far left: Not all molded propellers are created equal: some respond well to stress-relief boiling; others don't benefit at all.

part: about two years ago, my friend and I were flying helicopters. His new heli had a particularly nasty vibration that caused the nylon pin on the nylon clevis connected to the tail-rotor bellcrank to break. (Luckily, the machine was close to the ground, so there was no further damage.) I lent him an unused clevis that was about two years old and hadn't been boiled. He fitted this new clevis, and the helicopter shook itself into a hover.

A few minutes later, tail control was lost. This time, however, the clevis pin *didn't* break; it drove through the 1/16-inch-thick glass-filled nylon bellcrank for a distance of about a 1/16 inch, until it was no longer connected to it. Since then, I've also boiled all my nylon *clevis* parts!

BOILING

I use this method to boil injection-molded nylon:

Make sure the container you use is big enough to allow the part to be completely submerged in water. *Parts shouldn't just be thrown into the pot and allowed to rest at the bottom!* A "rolling boil" is *not* required, and in some cases, it can deform the part. I bring the water just to a boil and maintain that temperature (look for small bubbles—I don't bother with a thermometer) for half an hour to an hour.

DYE JOB

One nice thing about nylon is that it can be easily tinted with the fabric dye (liquid or powder) that's available from department stores and food stores. Its color, however, must be natural or white for the tinting to work. (I don't recommend that you bleach dark nylon to tint it another color, because this can weaken the plas-

tic.) Add the dye while you're boiling the parts. Usually, very little is required, but you may need to test to learn the best boiling time and the right amount of dye to use.

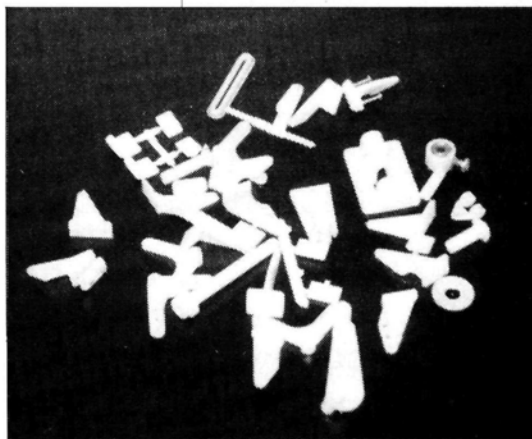
BEWARE OF IMPOSTORS!

If you're considering boiling and coloring, make sure that your part is, in fact, nylon! One manufacturer—Grish Bros.—urges that you neither boil nor tint its props—a request that puzzled me. I could understand not tinting, as the three-bladed props I'd bought were opaque silver—but not boil? Why? A talk with Tom Grish Jr. revealed that Grish Tornado props are now made of polyester, which will soften and become deformed when subjected to boiling temperatures! (Tinting shouldn't be attempted if boiling is required.)

OTHER REASONS FOR FAILURE

Surface cuts and deep abrasions are definite reasons to discard a prop. Like glass, when plastics are scored, they'll break on the score line. Glass-filled nylon withstands cuts and abrasions much better than solid nylon.

Many nylon and glass-filled-nylon parts have mold flash, and most nylon props have to be balanced before they can be used. *Be careful* when working on a prop that needs cleaning or balancing. To avoid making cuts when you're removing mold flash, use sandpaper instead of a knife. Start with sandpaper that's no coarser than 220 grit, and finish with 600 grit. To remove scuff marks and smooth



Some of the more widely used molded or machined nylon parts: control horns, steering blocks, bellcranks and hold-down bolts.

PARTS

New! Battery Powered Hobby Tools

How many times have you wished for a handy cordless tool while working on home, craft or outdoor projects? IHC has the answer - TOTEX BATTERY OPERATED TOOLS. No bother with cords too short, or tangled.

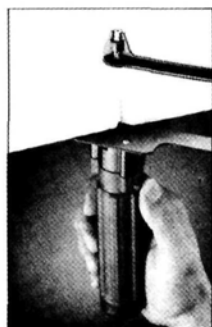
• Cordless Mini-Drill comes with five different accessories and 3 sizes of collets to fit various sized tools, for milling, grinding, engraving, drilling, etc.

• Soldering Iron heats up in 10 seconds. Soldering tip retracts to prevent damage or burns. Spare tip and flux centered solder included.

• Electric Scissors, safe because of the short movement of the blades. Cuts quick and clean, paper, vinyl, cloth, model coverings, etc. Made of the best quality stainless tool steel, heat

treated to 58 degree of hardness. Clear cover is a safety lock and a magnifying glass.

• Foam Cutter heating wire operates in 3 seconds. Spare hot wire and screwdriver provided for wire changes. Cuts to 1 3/4" foam quickly and easily.

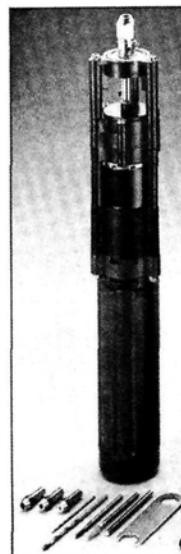


**Battery Powered
Foam Cutter**
No. 11003 \$13.98

With every Mini Drill ordered, we will give the Soldering Gun FREE. It's a great introductory offer, which will be cut off at the end of June 1990.

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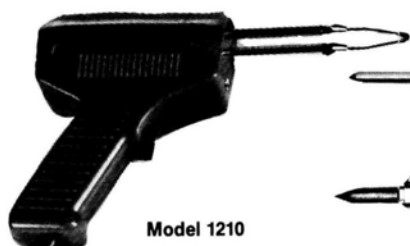
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K&S Engineering
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Chicago, IL 60638

Soldering Tools



Model 1210



Model 910



Model 300

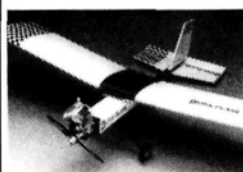


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- ★ Model 212 — Pencil type iron gives 30 watts capacity of fast heat for field repairs using a 12 volt battery for power.
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DuraBat
.40-size, 4-channel
aerobatic trainer.



CARE FOR PARTS

the surface, polish with a buffing wheel and plastic buffing rouge.

If the prop is only slightly out of balance, I usually shave its tip. On one that's badly out of balance, you must thin the pitch side of the heavy blade. Scraping is the fastest way to remove material gradually. A single-edge razor blade or utility knife works well, but don't allow the blade to jump or vibrate while you're scraping, or you'll make ridges in the material's surface. When done correctly, scraping will leave a smooth finish. Any nylon prop that requires extensive material removal, however, is best left unused.

Environmental factors also affect the life of a plastic part. In general, plastics don't like freezing temperatures, extreme heat or direct sunlight; cold makes them brittle, and heat makes them soft.

Nylon absorbs moisture and functions well with a moisture content. Some manufacturers (see the current Robbe catalogue) admit that nylon that dries out loses much of its strength, and they suggest that dried-out props be submerged, or even stored, in water.

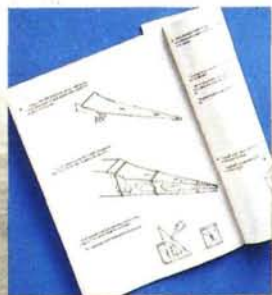
ARE NYLON PROPS SAFE?

—for me, yes. I boil *all* my nylon and glass-filled-nylon props and parts. During 25 years, I've never had one fail during normal operation, and I've only broken a nylon part on major crashes.

Keep in mind the manufacturer's recommendations when you consider altering a prop. If you're new to R/C, learn all you can before you work on one. Because prop manufacturers can't control how you might alter their products, they should play it safe and tell you not to change anything.

The bottom line in prop safety? It's as safe as we make it! ■

The Freedom 20.™ Proof positive



The Freedom 20's instruction booklet makes building easy—even if you've never built a model before.

Clear illustrations guide you through every step of construction and equipment installation. Covering materials and techniques are described, plus there's a section on adjusting and flying your plane.



ENYA .80

(Continued from page 74)

churned out. In general, the maxim, "There's no substitute for cubic inches," is borne out here, even though, at its peak of development, the turbocharged 1½-liter Formula 1 car engine at near to 1,000hp made a good attempt at disproving it! For modelers, the normally aspirated model engine is adequate, particularly for the more usual sport use to which most engines are put.

IDLING

Using a muffler and a 14x7 Graupner nylon propeller, speeds down to 1,700rpm at minimum throttle settings were possible, and the very effective Enya air-bleed slow-running adjuster screw proved, as usual, very easy to operate and predictable in effect.

Used throughout, the Enya no. 3 glow plug is admirably suited to the engine, and attempts with my favored OPS 300 thick-element plug were unsuccessful, giving poor slow and mid-range running.

The condition of the engine at the end of the test gave me no cause for concern.

SUMMARY

It's surprising how frequently we find that

the "capacity-increased" engine is a fine, reliable performer. It's almost as though the original, smaller engine were operating inside a structure that's slightly too large for it. Did the manufacturer tread a cautious path initially, but then give way to bolder thoughts? Well, that's happened here with the Enya .80 XF, and the result is an even more punchy 2-stroke for your existing aircraft.

**Here's the address of the company featured in this article:*

Enya Model Engines/Altech, P.O. Box 286, Fords, NJ 08863. ■

FAT CAT

(Continued from page 41)

the trailing edge has been shaped properly, sand the upper center sheeting and shape the leading edge. Be sure to sand a "flat" at the leading and trailing edges at the center. Taper the wing-bolt reinforcement and glue into place.

The landing-gear mounts are fully explained on the plans. The balsa pieces on each side should be scalloped for smooth entry and exit of the covering material.

The "bridgework" between the spar and leading edge doubles the torsional

strength of the wing, so it's well worth the extra weight and time taken to make it. These light, 1/8-inch sticks shouldn't be force-fitted and should be glued when the panel is flat on the board. Shape the wing tips as shown. The ailerons are long and narrow, so use pinned hinges. (Stiff hinges will limit aileron travel at the tips.)

Now fit the wing—straight, level and dead center. Use rubber bands and pins, double-check and mark the appropriate locations. Drill dowel holes from the front, insert measured dowels and anchor them at the spar brace. Remove the wing and glue the dowels with CA at the front and back of the leading edges.

Finish more of the fuselage now. Drill the firewall for the engine mounts, fuel tubing, etc. Hold the firewall in place with rubber bands around the nose section (in front of the firewall). Wet the outside of the fuselage at the tank area. Wait until tension eases, and wick CA into both sides, front and back. Install the nose doublers with epoxy.

I've seen so many accidents with fuel tanks that I now install a floor in the tank compartment, and there's even a drain. Spilled fuel ends up on the ground.

While the fuselage is "open," put the wing into place (at the mark you made),

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See the Freedom 20 at your local dealer's now—it's high time you were flying in style!

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MODELS INC.**

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WINGSPAN: 55½ INCHES
WING AREA: 440 SQUARE INCHES

LENGTH: 43 INCHES

POWER: .20-.30 2-CYCLE

.20-.30 4-CYCLE

FLYING WEIGHT: 52-60 OUNCES

RADIO: 4 CHANNEL

Kit includes engine mount, C.G. spinner, featherlight wheels, formed cowl and wheel fairings.

keeping wax paper between the fuselage and the wing where the bolt is attached. Glue the attachment plate into place while holding the wing tightly to the fuselage, and reinforce this plate with tri-stock. You can use CA here, but don't let it run wild. Drill and tap for 8/32 nylon bolts.

So that I could use a much lighter cover stock, I chose to use a center support rail for the top and bottom 3/32-inch sheeting. Most of the cover can be applied now, but stop short of the fin on top and the bottom bulkhead no. 6.

Glue on the lower front sheet and then the 1/32-inch plywood front cover. Use household scissors to cut a 4 1/4x6-inch length (across the grain). Make an initial "V" cut in front. (This will be shaped later.)

Start at the firewall, using CA on the outside. Holding the fuselage sides firmly, "wick" both as you progress. Wet the outside at the sharp bend in front, and continue up and around the nose. (I stopped short of the muffler extension and needle-valve location, but I also wicked some CA on the inside.) Now trim off the excess, and partially shape the clearance for the engine-shaft housing. The two stringers are installed last—before sanding.

Position the stabilizer against bulkhead 6, making sure it's square, centered and parallel to the wing. You can't do this just by looking. Measure...measure...measure! Here, I used CA to glue on the inside of the sides and bulkhead no. 6.

If you use a tail wheel, treat the rudder as you would a strip aileron. The use of light fiberglass cloth provides a dependable unit. The well-sanded inner Gold-n-Rod bearing is used longer than needed and cut to length later. Position it as shown, tack-glue it with CA, and then apply cloth with CA.

Glue in the fin when the unit (fin and rubber) has been checked for fit and operation. Position the aft "rails" to provide a flat platform for the aft top sheeting. Drill the lower tail-wheel bearing support in the center at an angle. Put the rudder in place temporarily, align the plywood support, and glue it and the bearing.

Remove the rudder. This will be the last part to be attached to the plane—after covering.

Start the hatch/canopy by shaping a length of cross-grain 1/16-inch balsa to within 1/8 inch of each side, then turn this over and add 1/8-inch square rails. To complete this, refer to the plans. I used a semi-pointed 1/8-inch dowel to fit a piece

of outer Gold-n-Rod for the rear hatch retainer, but you should use your favorite method. I enlarged the front screw holes to accept (to within 1/16 inch of the top) a piece of inner Gold-n-Rod, and after locking it into place with CA, I drilled it out with a 3/32-inch drill. I used two 2x1/2-inch screws here to lock the hatch in place.

As mentioned earlier, the nylon bearing material is ideal for strengthening the area of the horn attachment. A piece of inner Gold-n-Rod will also work, but it has to be drilled out somewhat. In either case, use CA to affix it.

If you haven't any good sanding blocks, you won't have good-looking models, but don't over-sand the fuselage corners, because you can't improve their looks by doing so. A 1/8-inch radius is ample.

Covering. I used MonoKote* for everything—including trim. Use a piece of cardboard to squeeze out bubbles under the trim. Start with low heat, and raise the temperature to seal it.

Engine and radio. I used Perry Rose's idea to soft-mount the K&B .20. If you intend to use the K&B with a spider mount, I suggest you at least use pads of

(Continued on page 83)

FAT CAT

(Continued from page 81)

1/8-inch inner-tube rubber. This is how I managed slight right thrust.

Please don't load this plane down with heavy batteries and servos. The original had a total of 10 ounces for the flight pack. This included four mini Royal* servos that have power to burn.

PERFORMANCE

As usual, I asked Bill Parenti to make the first flight. Within seconds, Bill had the plane trimmed out—one notch of down-trim. A loop, a roll and inverted flight. A stall proved it would behave like its small brother: nose so high that the fin and rudder get blanked out. Ailerons hold level flight as the tail wags back and forth—a warning of a stall. Recovery is straight ahead, with little loss of altitude.

Then it was Charlie Scholeon's turn, and he flew Fat Cat as though he owned it—which, in fact he does, and he has managed approximately 35 flights to date. Charlie wanted a tail-dragger, but I'd prefer a trike, as it would allow a more nose-high landing. This is an easy option, as the main gear can be moved to behind the CG. Add a nose gear, and you're all set. The choice is yours.

Takeoffs are easily controlled. After trimming, try a stall (at reasonable altitude) so that you can be assured that this bird won't snap without warning. You'll soon realize that the fuselage contributes to performance in many ways. When Fat Cat is throttled back, its slow-flying ability is surprising. Inverted flight needs only a touch of elevator, and it performs beautiful rolls with only ailerons. For spin recovery, just release the sticks.

I thank the members of the Flying Aces and R/C Falcons clubs for their help and encouragement. Thanks to Bud Carlson and Mel Young for the flying pictures. Oops! I nearly forgot Randy Randolph. Without his "push," this might not have been another step for us *small-steppers*.

**Here are the addresses of the companies mentioned in this article:*

K&B Manufacturing, 12152 Woodruff Ave., Downey, CA 90241.

MonoKote; distributed by Top Flite, 2635 S. Nabash Ave., Chicago, IL 60616.

Royal Products Corp., 790 West Tennessee Ave., Denver, CO 80223. ■



OLD-WORLD MODELING

(Continued from page 46)

France are about 40 percent higher than British ones, and he told of one Frenchman who would vacation in England and pick up £200 to £300 worth of plastic covering at the shop. He would then sell it at sufficient profit to pay for his tour, and he still saves his friends money. When I reached Paris, I saw why this would work.

AERONAUTIQUE FRANÇAIS

After lunch at a Parisian McDonald's (where we had to *pay* for a glass of water!), my wife (and interpreter par excellence) Sue and I visited EOL Hobby Shop—one of three family-owned hobby shops in the French capital.

The display window was packed with planes, ships, cars, helis and the most beautiful brass and hardwood cannons and working steam engines you ever saw. Inside, while my mouth hung open and my mind rapidly converted prices in francs into dollars, my wife told the "directeur," Monsieur Bessede, who we were and asked if we could tape an interview with him and take some pictures. I know just enough French to order a beer and find the restroom, so I was glad I had an interpreter!

How popular is modeling in France?

"It has become much less important in the '80s—half or less participation. In Germany and England it is better; in Spain it is less than in France; and in Italy, they are producers: they make a lot of things, but their market is small."

There seems to be a disturbing worldwide trend. Both Mr. Woolidge and M. Bessede bemoaned the steady decline in modelers' patience during the last 25 years. "Where a modeler once took months to complete a project, he now just wants to finish the airplane quickly and fly it." Both say there's a danger in the movement toward ARF kits.

M. Bessede: "Buying an ARF kit is not enough (to make a successful modeler). Several hours later, plane, motor and radio are on the ground (in pieces). The person didn't learn how to put it together or how to fly it—no mental understanding. They go to a club, but they think they are 'playing,' so they don't get the needed help. The person thinks he knows what he is doing, but he doesn't, because he didn't work with it, build it and understand it. After the inevitable crash, he

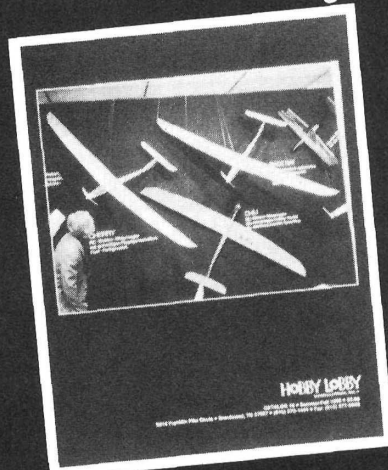
(Continued on page 86)

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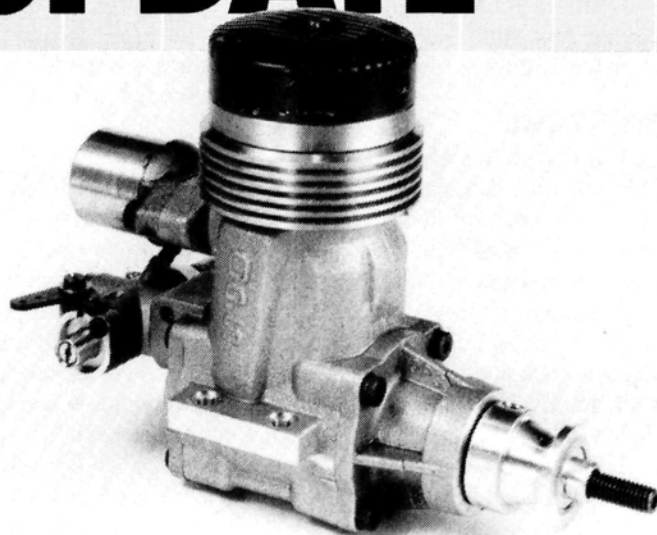
OPS 80

FAN ENGINE UPDATE

by Mike Billinton

EDITOR'S NOTE: In our May issue, Mike Billinton described his usual thorough tests of the OPS 80, but the tests were cut short by a prop failure at approximately 22,000 revs. This led to the failure of the front bearing on the engine, which then, of course, required a rebuild. So impressed was Mike by the engine's potential that he rebuilt it and completed the testing. The results are shown here with the revised graph and performance figures.

THE ENCORE AFTER REBUILDING



TEST 3

OPS pipe now shortened to 285mm. Plug/fuel as in Test 1. (OPS 250 glow plug; fuel—5 percent nitro/10 percent castor oil with 5 percent ML70 synthetic oil.)

After the disaster of Test 2, I rebuilt the engine to look again at its

capabilities. Shortening the pipe led to the expected gain in rpm and consequent slight increase in horsepower. Shortening the pipe header by just 2 centimeters led, however, to a narrower, more critical performance band.

TEST 4

Pipe reduced to 265mm. Plug/fuel as in Test 1.

This final attempt to raise the peak resonance point even higher in rpm eventually forced the engine up to the 21,000rpm area where the manufacturer's claim of 4.55hp occurs. It was gratifying to reach 4.43 at 20,794rpm on 5-percent-nitro fuel, though this short-pipe setup proved to be critical; the motor easily came "off-song" if the pipe temperature varied too much.

Fuel settings were also now quite narrow. This final pipe shortening was interesting in that the pipe's header structure seemed to allow this short length, but no more. This implies that OPS may see this exhaust manifold/header configuration as having reached its shortest useable length when cut to this point.

Of the three pipe lengths chosen, the longest out-of-the-box has the most flexible, wide-band response;

SPECIFICATIONS

PERFORMANCE:

| | | |
|--------------------|----------------------------------|------------------------------|
| Max. BHP | 4.43 at 20,794rpm | (OPS pipe at 265mm/5% nitro) |
| | 2.64 at 17,100rpm | (Open exhaust/5% nitro.) |
| Max. Torque | 208 ounce-inches at 18,300rpm .. | (OPS pipe at 305mm/5% nitro) |
| | 182 ounce-inches at 12,800rpm .. | (Open exhaust/5% nitro) |

RPM ON STANDARD

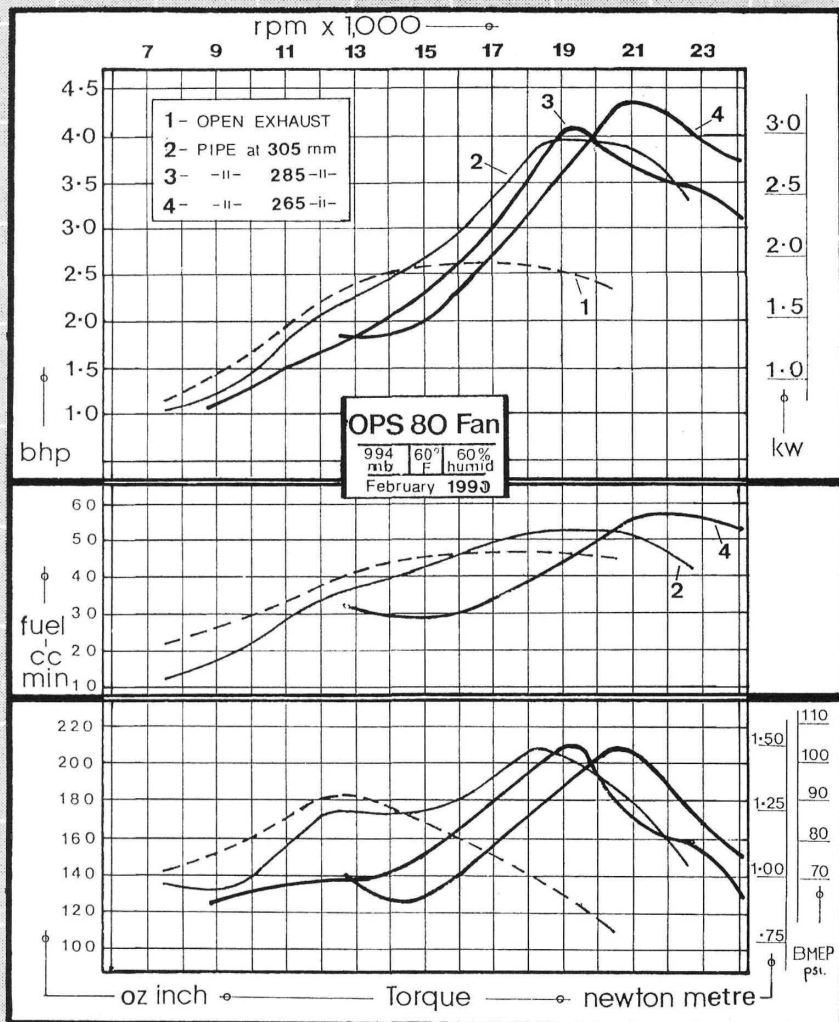
| (fixed-wing) propellers: | Open Exhaust | Tuned pipe at 305mm |
|--------------------------|--------------|---------------------|
| 13x6 MK | 12,644 | — |
| 12x6 Graupner | 14,678 | — |
| 11x7 Master | 15,600 | 15,900 |
| 11x6 Graupner | 16,368 | — |
| 10x6 MK | 17,200 | — |
| 9x6 Master | 20,020 | 22,200 |

PERFORMANCE EQUIVALENTS:

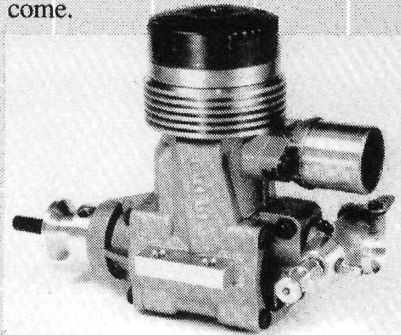
| | | | |
|-----------------------------|-------|-----------------------------------|-------|
| BHP/cubic-inch | 5.53 | Gram-meter/cc | 11.28 |
| BHP/cc | .337 | BHP/pound | 3.26 |
| Ounce-inch/cubic-inch | 259.8 | BHP/kilo | 7.2 |
| Ounce-inch/cc | 15.85 | BHP/square-inch frontal area | .56 |

Manufacturer: OPS Engines, Monza, Italy

U.S. Distributor: Shamrock Competition Imports, P.O. Box 26247, New Orleans, LA 70186



matters become progressively more critical the shorter the lengths become.



For these short lengths, in particular, an in-flight needle control (a standard OPS accessory) would certainly be useful, though it would make the engine more complicated.

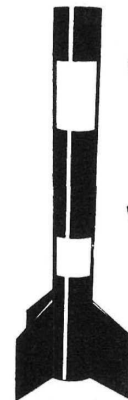
The problem of head-bolt slackening after high-peak runs occurred markedly during Tests 3 and 4. This has been a disadvantage with other

engines, and, after this OPS 80 test, I conclude that the combination of high hp/large heat release and small, relatively delicate 60-size engine structures makes the problem a certainty unless you take special precautions. The problem doesn't occur with the more massive marine 90s that operate at similar hp levels, so it must be a consequence of "not much metal for the hp," i.e., the bhp/pound ratio.

Two re-tightenings of the four OPS head bolts after high-heat runs seemed to do the job, as no further bolt torquing was needed. Because I failed to spot the problem sooner, I had some abortive, erratic runs that were obviously caused by compression leaks.

That's the complete story on this formidable engine.

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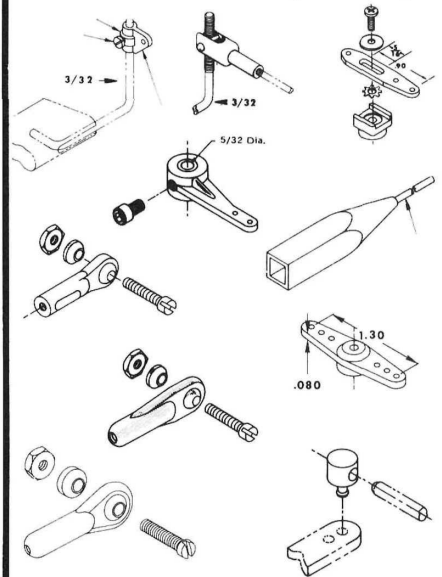
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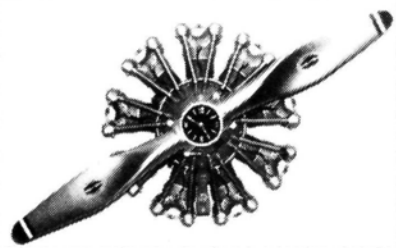


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OLD-WORLD MODELING

(Continued from page 83)

says, 'Oh no; this is not for me.' " M. Bessede claims that there's a risk in selling an ARF kit for that reason.

"We help many people," he continued; "A person may call us from his home, but until we meet him in the shop, we will not sell him anything. In this hobby, mail order does not function in France." Picture an American businessman refusing to sell a product until he meets the customer!

So how can we explain the lack of interest in R/C in France? Many apparently see models as "toys," and this image is hard to break. Show teams like those we have in the States aren't as active, and since the few who are on French teams seem to have enormous egos, the public just doesn't identify with what the teams do.

The economy might be a factor, too. Comparisons are difficult to make because of fluctuations in the exchange rate, but the average French income seems to be about half that in the States, while prices are much higher. A leading French hobby monthly lists a 4-channel Futaba

(Continued on page 88)

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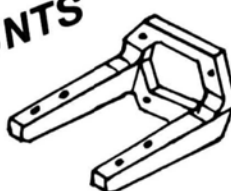
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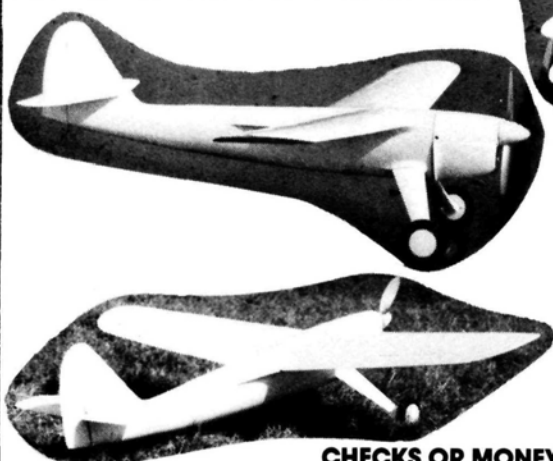
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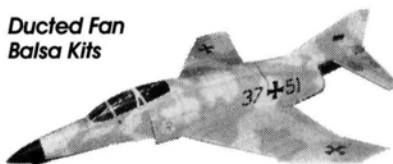
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OLD-WORLD MODELING

(Continued from page 86)

Conquest radio at about \$290; an O.S. 26 4-stroke at \$215; and a Champion Schluter helicopter at \$835. Taxes like the 20-percent annual inventory tax on all stock are also a disincentive.

Although things cost more in France, the insurance issue is less complicated. "In France, there is an insurance multi-guarantee (multiple coverage) that covers all phases of modeling. When you're in modeling, you tell your agent and the coverage is added to your policy. Very simple."

After these brief visits to just two hobby shops in London and Paris, I concluded that compromise is part of life. Americans have higher incomes, lower prices and good selections, but little (in the case of mail order, virtually none) personal service or help. I, too, would like to see what I'm buying. The description, ".40-size tail wheel" doesn't tell me if it will fit my 1/7-scale Taylor craft. Someone three states away really doesn't care whether I have my fuselage formers straight, or whether I know how to set up my plane properly for its first flight.

Yes, it would be nice to have a Mr. Woolidge or a M. Bessede in my home town, but am I *really* willing to pay more for my kit, radio and engine just to find someone who is really interested in my progress with my Telemaster? Are you?

CGM FREEDOM 20

(Continued from page 53)

fold when you see the finished product!) Begin with coarse sandpaper and finish with a fine grit (400 works well for final sanding). Use a vacuum cleaner with a soft-brush attachment to remove all the dust. This will allow the covering to stick to the structure, not to the sanding dust!

I covered my Freedom 20 with Sig Manufacturing's* iron-on Supercoat. This was the first time I had used it, and it went on easily, even around corners and radii. I painted the cowl and the wheel pants with Sig's Supercoat paint, which matched the covering perfectly. Don't forget to paint the wood inside the cowl to help protect it from fuel. An ample coat of resin works best. I achieved the checkerboard design by using Top Flite's* checkerboard trim sheets, and the pin-stripes on the fuselage are automotive striping tape.

Radio installation wasn't a problem, as there's plenty of room to accommodate any 4-channel system. I chose the new Kyosho* Advance 5-channel PCM (see sidebar), and my engine is an O.S.* 25 FP series, which is more than ample.

AIRBORNE AT LAST

Check the flight controls for proper throws and direction, and don't forget the CG. I've seen many aircraft not make it much past liftoff because of an incorrect CG, so check it! When I had run a few tanks of fuel through the O.S. and established a reliable idle, it was time for the moment of truth!

With a stiff 15 to 20mph wind and an aircraft that weighed a little over 3 pounds, I thought takeoff would be exciting. Was I disappointed! With the takeoff roll directly into the wind, I made minor corrections with the nose wheel, applied a little back-pressure on elevator, and the Freedom 20 was airborne! After climb-out and a wide left turn to head back, I fed in a couple of clicks of left aileron and established level flight.

The plane tracked pretty well in a loop, and I didn't need a mile of airspace between the tires and the ground for an aileron roll. The Freedom 20 doesn't fly like a rocket ship, or dart around. Beginners will appreciate its moderate air speed: with the control-surface throws set as the manufacturer suggests, nothing happens too quickly.

When it was time to land, I did one more lap, turned on final and lined up into the wind. The Freedom 20 sets right up and doesn't show any tendency to tip-stall. Could it be that tapered wing?

The Freedom 20 was enjoyable to build and fly—there were no surprises—so it would be great for beginners. It's also a bargain, which answers the *third* usually asked question, "What does it cost?"!

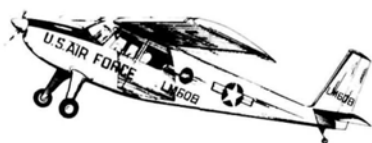
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BEFORE & AFTER

Here's a good example of the staying power of model airplane construction. That young fellow in the first picture is Ted Pratt of Pahrump, NV, and the airplane he's working on is a Quaker Flash, which will be powered by the Gwin Aero engine he's holding in his hand. The Flash was Ted's first gas-powered

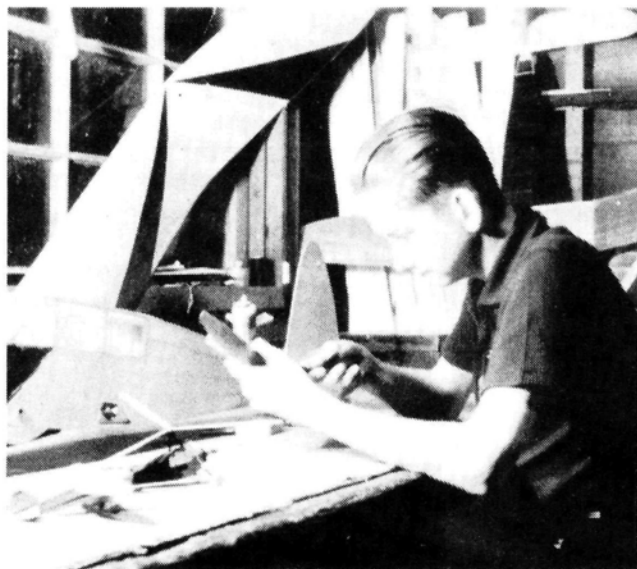
model. In the background are a couple of the rubber-powered models on which Ted (and many of us youngsters) learned the tricks of building light, strong airplanes.

The gentleman in the next picture is Ted Pratt of Pahrump, NV. The airplane he's working on is a Flyline Quaker Flash, which will be powered by the G-Mark .03 he's holding. (That Flash is *not* Ted's first R/C airplane!) In the foreground is a rubber-powered, peanut-scale Lysander that Ted (and the rest of us older modelers) like to build so we can keep learning about strong, light airplanes.

By the way, in the second shot, there's a Pulse Commander transmitter sitting on Ted's bench. That radio system was about the lightest single-channel radio that could be installed in an air-



Ted Pratt at work on a smaller Quaker Flash, a few years later!



Ted Pratt at work on his Quaker Flash.

plane. It used a "magnetic actuator" that caused the rudder to flip from side to side at a fairly rapid rate. When the stick was moved to the right or left, the rudder would "dwell" on that side for a time equal to the stick movement. The result was proportional control of the rudder. The airborne system weighed just a couple of ounces and could be installed in the smallest of airplanes. The system used a very simple, very wide-band receiver that's no longer practical in today's crowded frequency channels.

That 3-channel Fleet, powered by a G-Mark .03, is another example of Ted's handiwork. A .03 cylinder is in that cowl, hidden behind the prop, just above the spinner. Ted says he bought the engine and the Cannon radio because of comments in this column. I'm glad he liked it; I don't have a .03, but my

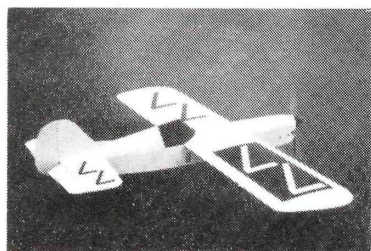
.061 is the most-flown engine in the hangar.

Before we leave the state of Nevada, here's a tip from Ted: strip the insulation from a TV twin lead, and you'll find clean, stranded copper wire that can be used to wrap joints in landing gear before soldering. Use as many strands as you need to do the job.

Speaking of the G-Mark engine, John Marek of Webster, TX, scaled down a Goldberg Eaglet to $\frac{3}{4}$ of full size; he calls it an "Eaglet 38." It's powered by the .061, and John reports that it flies very well. With a 4-channel radio, 2-ounce tank and a steerable nose wheel, the whole thing weighs only 24 ounces.

There are many sport designs out there in the medium-to-large range that would make very good smaller airplanes. Some manufacturers offer various sizes of the same airplane for

that very reason, but if you do it the way John did, you can change things here and there that would better apply to smaller airplanes. Over the years, plans for hundreds of airplanes have appeared in *MAN* and other publications, and they can be scaled to any size by modern copy machines. There



Derek Woodward's Little Special lost its life when someone got on its tail!

really isn't any limit to what can be done with small airplanes!

ATTENTION MEMBERS OF SMAL(L)...

Several members have suggested that we add a letter to the logo that's being designed for this fine organization. A slight name change would be involved, from Small Model Airplane League to Small Model Airplane Lovers League. Since it seems that the change is sure to be approved, I'll start calling it SMALL in this column.

Englishman Derek Woodward, who gave us the idea for SMALL in the first place, writes:

"A little model shop tells me that the next shipment of Cannon R/C is due soon, and I have my name on a set. They're a bit pricier than buying from the U.S., but they have a service department that sorts anything that didn't cross the pond too well. I've been casting an eye around recently and, after looking closely at several kits, I feel an urge to do strange things with a magazine-size drawing of the old Astro Hog and one of my baby engines. A 36-inch span for a PAW 80 (.049) R/C Diesel I've acquired seems to be the favorite.

"Another possibility is a small-



This beautiful Fleet is powered by a G-mark .03. It could easily pass for a 1/4-scale model!

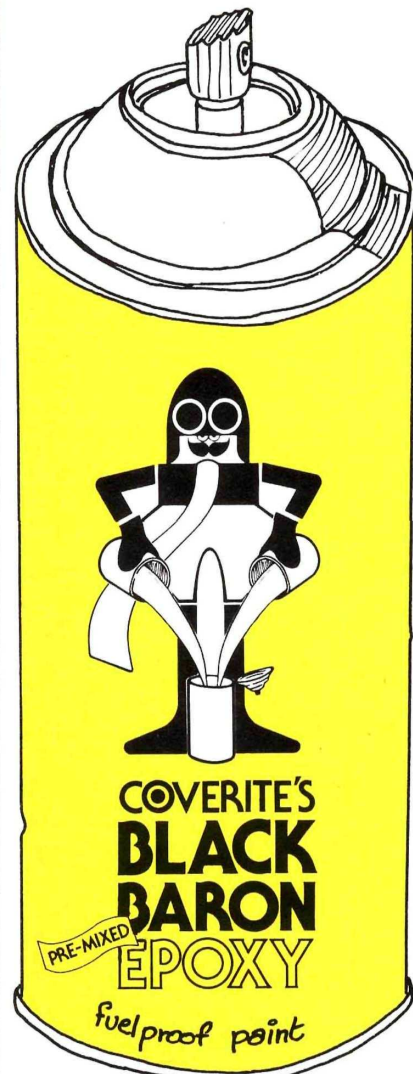
scale version of Little Special. The design flies very well, but suffers bad luck. In a pylon race, someone sawed the tail off the .25 version (as I was leading, no less!), and pilot error saw the end of the larger version. Oops—should I mention that one?

"The real founder of the SMA (Small Model Association), Peter Miller, has a Midget Mustang in testing right now: a 24-inch, 15-ounce number for rudder/aileron/elevator and a TeeDee .049. It goes!

"This country has gone crazy! Every meeting is turning into a large-model benefit, and the BMFA/SMAE has moved the national weight limit for a model up to 7kgs (14 1/2 pounds), with more to come. We'll soon need air-traffic clearance to fly in what airspace England has!

"One of our large-model fanatics let me drive his 1/4-scale CAP recently. After I flew it around, threw a few stunts and gave the transmitter back, he asked what it felt like. He went quiet when I said the transmitter sticks didn't feel any different from mine; it was boring to fly; and did he want me to chip in for the 1/4 gallon of glow fuel he'd used that flight? Wonder why?"

Derek has been smitten by the sod farms of Arkansas, as Joe described them, and when he moves back to the U.S., he wants to consider that area for settlement! He could do a lot worse! ■



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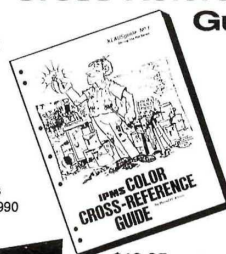
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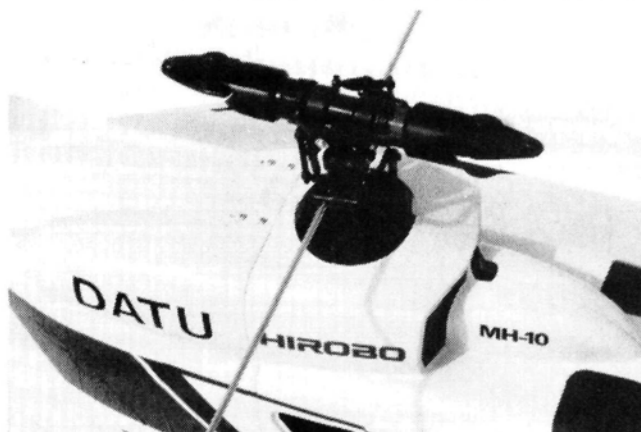
HELICOPTER SECTION

94 Hirobo MH-10/BK-177

98 Heli Challenge

101 Tooling Up for Helis

In this month's Heli Section, we're pleased to present the first full-blown review of the new Hirobo MH-10, which represents a great achievement in further reducing the size of R/C helicopters. Along with Datu Ramel's review, Jerry Hicks gives you some solid direction as to what tools you'll need for your heli involvement, and our resident ace, Craig Hath, provides information that all heli fliers will find helpful. Kyosho's Jet Ranger body conversion for the Concept 30, which we had hoped to have for this issue, will appear in the August issue.





HIROBO

MH-10/BK-117

by DATU RAMEL

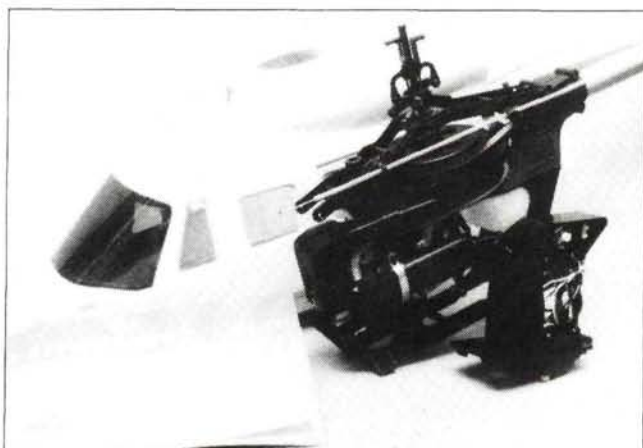
JUST WHEN .30-SIZE equipment is a familiar sight, there's a new kid on the block. Hirobo* has introduced the MH-10—a

small, almost-ready-to-fly helicopter that's powered by a .15-size engine.

The appeal of the Hirobo MH-10 is similar

to that of 8mm or VHS-C camcorders. Sure, a camera/portable VCR combination (analogous to a .60-size heli) can do it all, but many people

are willing to sacrifice some performance (recording time in one case; speed and agility in the other) in order to have the same functions



Major components of the MH-10/BK-117.



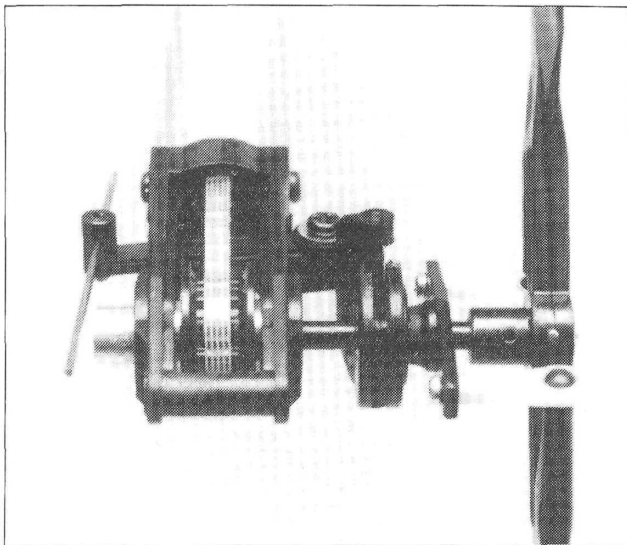
MH-10 clutch, mounted atop the main gear, drives the tail rotor.

A .15-powered, production heli with some very clever design features

(picture quality; hovering with collective pitch) in a smaller package.

THE KIT

The MH-10's rotor head is a smaller, underslung, single-axle, Shuttle design that's molded from fiber-filled plastic. The head and blade grips look bulletproof because they're large in relation to the rest of this mini helicopter and especially to its 6mm-diameter main shaft. If you were used to .60 helis when the Shuttle and the Concept first appeared, you probably wondered, "How can these flimsy .30 birds stay together?" Now, if you're used to .30-size helicopters, the MH-10's rotor head will look positively over-



MH-10 tail rotor with belt drive, modified slider and "bearingless" blades.

built.

The rotor blades are wooden, asymmetrical airfoils that span 35½ inches. (The Concept 30's span is 45½ inches, and the Champion's is 55 inches.)

The MH-10's "bearingless" tail rotor is molded in one piece, similar to the optional Kyosho unit now available for the Concept. Tail-rotor pitch is controlled by a one-piece, molded component that combines the functions of a sliding grooved hub, a rotating pitch plate and two short links to the blades.

The manufacturer has reduced the parts count; unfortunately, the yoke of this particular pitch slider didn't survive the trip from Japan. Andy Calvimontes of Chicago's Stanton Hobby Shop rush-ordered a replacement; in the meantime, I bonded a servo arm and two snap links to the tail-pitch hub.

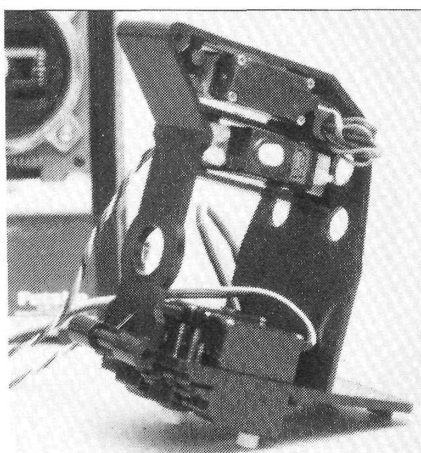
The tail rotor is belt-driven, but the tail unit looks more like that of the GMP Legend than the one on the Hirobo Shuttle. The toothed belt and pulley are exposed between two side plates that are bolted to (not clamped around) the tail boom. At the front of the tail boom, two side-frame-mounted idler pulleys divert the belt

around the large (50-tooth) timing pulley, which is also the clutch bell.

CLUTCH INNOVATION

The clutch configuration is one of two major innovations Hirobo made in this machine. The three metal clutch shoes are mounted directly to the large main gear, whose 136 teeth combined with the pinion's 14 teeth gives a 9.7:1 ratio. Yes, that's right; the clutch is at the second stage, on the main shaft, not on the engine. I can think of three benefits of this arrangement:

- it does away with the need to tediously align the clutch, starting mechanism and engine shaft;
- at the second stage, the lower revs (the clutch rotates at the rotor-head's speed) subject the shoes and their springs (in this case, O-rings à la Kalt) to reduced levels of centrifugal stress;
- and the larger diameter means more clutch shoe and lining area is



One-piece servo carrier with five Futaba S133s.

MH-10/BK-117

available to do the grabbing and heat dissipating.

Another advantage of a second-stage clutch is that it doubles as the autorotation clutch. When the engine stops, the main gear also stops, the clutch shoes disengage from the clutch bell (which is fixed to the main shaft), and the main shaft, rotor head and blades are free to keep turning. Since the tail-rotor belt engages teeth in the clutch bell, the tail blades turn as long as the main blades do. Thus the MH-10, in effect, comes with a driven tail rotor as standard equipment.

The main shaft that supports the rotor head is 6mm in diameter, but down between the side frames, it's bolted inside a 12mm-diameter, slotted, aluminum sleeve that allows the four control rods from the swashplate to slide up and down and stay in phase with the head. This mast sleeve is supported by four 12mm-i.d. bearings, two of which serve

as top and bottom main-shaft bearings, and two as clutch bearings.

Engine cooling is accomplished by vanes molded into the bottom of the main gear, and they force air forward to the cylinder head through a sealed shroud.

The bronze flywheel is integral with the motor pinion, and a female hex start-shaft fitting comes attached to the pinion. The male starter shaft comes with the kit. The engine sits high in the side frames, ahead of the main gear and just aft of the servo carrier.

I used an O.S.* CZ-H engine with a displacement of 2.49cc/.152 cubic inch. In the O.S. line, engine sizes of .10, .11 and .15 cubic inch are common; the CZ-H takes a familiar design and fits a rectangular heat-sink head. An Enya*.15-size engine will be available as an installed option for

MH-10s imported by Altech.

Even though those on the early prototypes were made of metal, the production side frames are of fiber-filled plastic. Hirobo, whose Shuttle pioneered the use of composite side frames, incorporates a lesson learned from that experience by using metal reinforcement brackets to attach the aluminum motor-mounting bracket. This should reduce the movement of the bracket's bolts in their holes, and this will keep the engine and gears properly aligned.

I like the muffler design: it's thin, oval in cross-section, and its rear two-thirds is made of molded silicone. We use soft silicone in our .60-size tuned-pipe exhaust systems, and Hirobo has come up with a floppy muffler for its mini.

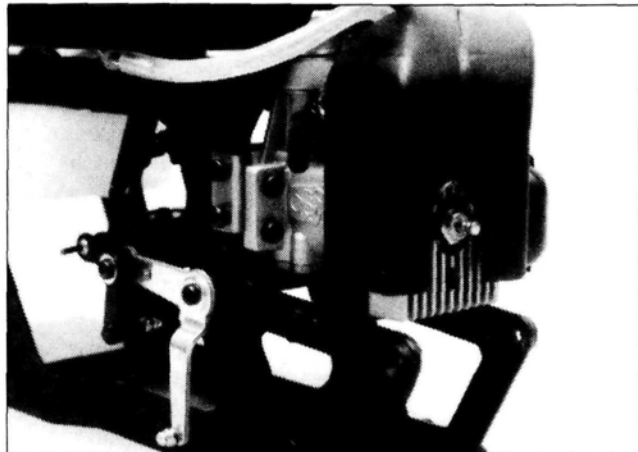
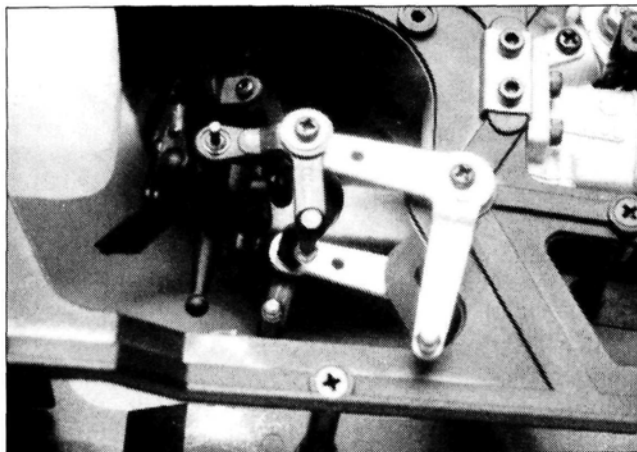
Fuel is carried high and aft in a bobtail-shaped plastic bottle

just below where the tail boom attaches to the mechanics. Beneath the drive-train components, there's lots of room for the rear-mounted gyro and the phantom outer swashplate.

SWASHPLATE SOPHISTICATION

The absence of an outer swashplate is the other new aspect of the MH-10; you could also call it an "inverted joystick" or a "gimbal" swashplate. This nifty Hirobo design performs the functions of a swashplate (i.e., it sends cyclic and collective commands to the rotor head), but it doesn't look like the unit with which we're familiar. This system doesn't use a swashplate ball, and the main control joint for the elevator linkage is where the bottom of the main shaft should be!

Do you remember your childhood toy gyroscope that had a rotor inside a circular metal cage? Think of a



Left: Aileron, elevator and collective-pitch control commands are sent to the MH-10 rotor head by this hanging swashplate located low between the side frames. Right: O.S. CZ-H engine mounted high up front.

regular swashplate as attaching the input and output links for tilting commands at three or four points around the circumference of the toy gyro's rotor, the plane of the familiar inner and outer swashplate rings. Now think of moving one of the tilting controls to the bottom of the gyroscope's cage, where the rotor's axle turns in its bearing.

The MH-10 replaces the outer swashplate ring with a three-point, Y-shaped bracket, whose aileron balls lie at the equator and whose elevator ball sits at the south pole at the bottom of a rod. The whole works is suspended between the side frames and below the main shaft bearings by a clever set of links. In the Hirobo design, the inner swashplate rotates on top of the elevator "stick," in synch with the rotor head (thanks to



MH-10 rotor head comes assembled.

ing the slight complication of keeping four links to the head sliding parallel to the main shaft) to put the swashplate somewhere different? The "under-decks" swashplate reduces the rotor head's height above the side frames by almost 2 inches, compared with a conventional sliding-swashplate design.

used), and it improves weight distribution by placing the rotor disc closer to the helicopter's center of gravity. Both the MH-10 and the Concept 30 designs result in a short pendulum moment with benefits in cyclic response and agility. The MH-10 rotor head is close to the mechanics, and this helps the appearance of the machine when the BK-117 fuselage is fitted. In fact, the fully tilted MH-10 flybar clears the engine nacelles by a scant 1/2 inch.

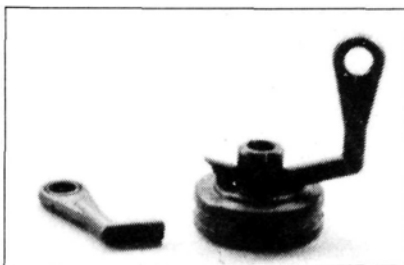
SERVO SAVVY

Once the first wave of MH-10s are in pilots' hands, most of the operational questions will center on the one-piece servo carrier. The part itself isn't controversial: there's no woodwork; there are only four screws to attach; and (I hope) it's cheap and easy to replace. The problem is: how do you

configure your R/C flight pack to fit this new size of model helicopter?

To keep width and weight down, the instructions specify that only certain miniservos will fit the 14mm openings in the servo tray (Futaba* S135, S133 and S143; JR* 3035; and Airtronics* 401). The S130s or 131s you planned to pirate from that machine in the corner of your basement won't fit unless you build your own servo tray. (I seriously considered this when I faced the prospect of spending \$150 or more on five new servos.) I thought of using only four servos (by using one servo to actuate both the throttle and collective, as I've done with other .30-size ships), but those two linkages are much farther apart on the MH-10, and the instructions don't specifically men-

(Continued on page 120)



The stock tail-rotor pitch-control slider was damaged during shipping.

the four slider rods that lie parallel to the main shaft). Instead of pivoting around a ball, the MH-10's inner swashplate tilts and turns inside the linkage cage described earlier.

Why would Hirobo go to all the trouble (includ-

Kyosho has already taken a step in this direction by using a stationary swashplate above and a collective-pitch slider below the Concept 30's upper bearing.

A shorter main mast saves weight (by virtue of the steel that *isn't*

Helicopter Challenge

by CRAIG HATH

Off to the Flying Field

Preparation and checklists -key items

YOU SHOULD NOW be ready for your first outing to the flying field, but before you go, take a few extra precautions to prepare your helicopter and your gear. This month, I give you a preflight checklist, which you can cut out and keep in your toolbox, and I also look at some of the equipment that you should always take to the field. (See sidebar.)

If you're a beginner, sooner or later, you'll probably have an accident and damage your machine. By developing and following through on a preflight program, you can reduce the likelihood of having a crash caused by mechanical failure. You won't gain flying experience if your machine is constantly on the bench being repaired.



Above: It looks as if Ken Wilson has taken the heavy-equipment approach. Actually, this stuff belongs to Bob Pickens, and Ken is just bumming a start off Bob, since he probably didn't even bring his own fuel!



Left: A card table keeps your models off the ground and reduces the strain on your back when starting.

PHOTOS BY CRAIG HATH

- Be sure that your receiver and transmitter batteries have been charged for at least 7 to 8 hours. Never attempt to fly before charging your batteries. If you're the forgetful type, buy a field fast-charger.
- Remove the canopy and inspect all radio gear and electrical connections. Inspect wires for cuts, and make sure that all shock-mounted parts are firmly held in place and that there's no danger of the parts shaking loose.

WHAT YOU NEED AT THE FIELD

OVER THE YEARS, I've seen fliers vacillate from hauling half their workshop and most of their parts inventory out to the field to barely carrying enough gear to fuel and run the engine. Some people are never sure what they'll need, so they take too much with them, while others think that if something does go wrong, they'll go home to fix it.

I take the middle-of-the-road approach: I don't like to work on my machines at the field, but I don't like to end a good flying session simply because I'm not prepared for a minor problem. I carry a basic assortment of tools and parts, but I've learned that if some major part fails, other components usually need attention also, and then the



At the field, Dan Melnik uses his starting caddy, a fuel can and the small parts box on the right. You won't need much more than this.

- Double-check all linkage-control connections. If you're using universal ball links screwed onto servo arms, make sure that the screws aren't loose. Also, check to see that all ball links are properly seated.
- Switch your radio system on and inspect the control movements. Look for binding or slop, and correct if necessary.
- Check for proper direction of control movement. You never know when something will get turned backwards.
- Manually rotate the rotor head in both directions, and check for rough or excessively sloppy operation of the helicopter's basic mechanics. Make sure that the tail-rotor drive system is functioning properly and in the correct direction. Correct any gear-mesh problems.

- Inspect fuel lines and tank for cracks, and repair them, if needed. Be sure that the clunk in the fuel tank freely touches the tank's top and bottom.
- Check for any loose fasteners, cracks in frames and damage to any area. Make sure that all parts are in good working order.
- Replace the canopy and check the location and connection of the receiver antenna.
- Check the entire machine for airworthiness, and repair anything that appears to be substandard or malfunctioning. Don't compromise your equipment because you're eager to get to the flying field. ■

work becomes too difficult to handle at the field. On the other hand, if you've traveled to a contest or fun fly, you'll need more elaborate equipment. Your preparation for these events is based on how serious you are and how far you've traveled to get there.

For a normal flying session, I take all the hand tools necessary to break down the machine. This doesn't include every luxury tool that I use in my shop; just the basic drivers and wrenches. I have a supply of emergency repair items, like cable ties, rubber bands and electrical tape. In case something loosens and is lost, I have a small plastic box filled with miscellaneous nuts and bolts. Of course, I also take all the

necessary fueling and starting accessories, a battery checker for testing the charge on receiver batteries, some spare glow plugs, a pitch gauge and a small bottle of CA. I don't drag a lot of stuff along with me, and my field box is large enough to hold everything.

Don't forget the instruction manuals for your helicopter, engine and radio system (especially the radio and engine manuals, since many of the fine adjustments are made at the field). A folding card table keeps my helicopter at a comfortable height; and, last, but not least—take a lawn chair for all those in-between flight-hangar sessions.

R/C HELICOPTER PREFLIGHT CHECKLIST

1. Radio system batteries fully charged.
2. Remove canopy, inspect all radio gear.
3. Inspect all control linkages.
4. With radio on, check for proper control operation.
5. Check for correct control direction.
6. Check for smooth operation of mechanics.
7. Check fuel lines, tank and clunk.
8. Inspect for loose nuts and bolts or cracks.
9. Replace canopy and check RX antenna.
10. Double-check entire machine for general airworthiness.

TOOLING UP • FOR HELIS •

Equipping the bench and box with "the right stuff"

by JERRY HICKS



A well-stocked heli tool box. This one contains nearly everything you need. Not all are necessary, but they make building and maintenance easier.

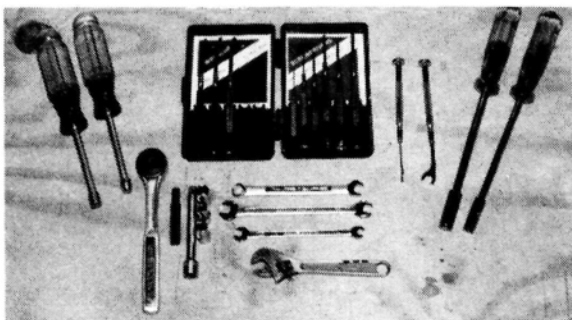
IT'S EASY to get started in R/C helicopters if someone helps you make the decisions. Maybe you're lucky enough to live near a heli club, or you know an experienced flier, but what do you do if you're on your own? This article will help you decide which tools and accessories you'll need to become an active heli flier. Where possible, I'll mention alternatives, and rest assured that I've used these products and that my opinions are honest and straight from the toolbox.

Let's start with the obvious: You'll need a helicopter, a radio, a gyro, an engine and a muffler. You'll also need a tool kit with some basic tools.

Allen wrenches. Some kits include a few Allen wrenches and wrenches for holding the various nuts. There are several types of Allen wrenches (also known as socket-head wrenches), and they're available in short, long, ball-end, right-angle, T-handle and combined configurations. I like the ball-end wrenches. The working tips, which are shaped like balls with flats that

match the intended socket-head screw, can be inserted into the screw head from a wide angle and still effectively turn the fasteners without slipping.

Ball-end driver. A ball-end driver is versatile. It usually comes in long lengths, and it has a plastic handle for a comfortable grip. Popular brands include Du-Bro* and Bondhus*.



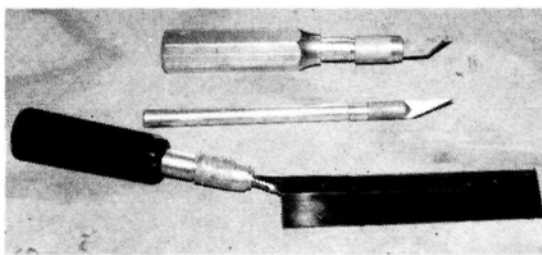
A variety of screwdrivers, wrenches and nut drivers will serve you well.

Right-angle wrenches. Because of their shape, right-angle wrenches offer more leverage. They're usually less expensive, and they can reach more places than ball-driver wrenches, i.e., between the side frame and fuselage sides. There are also combination socket-head wrenches that have a right angle on one end and a ball driver on the other.

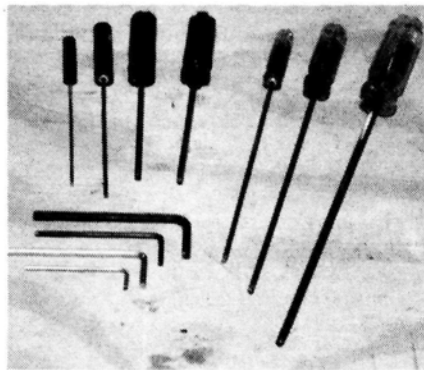
Wrenches. Along with the

socket-head wrenches that hold the bolts, you'll need something to turn the various nuts that go on them. I prefer open-end wrenches because they'll fit anywhere the available spacer exceeds the thickness of the wrench. In other words, if there's room for the nut, there's room for the open-end wrench. I have a jeweler's set that has a thin cross-section at the working end and a fluted handle on the other for an easy grip. While box-end wrenches (those with gripping surfaces that completely enclose the nut) are also efficient, you can't always get them onto the fastener. I have a set of these in my toolbox, but they aren't necessary.

Screwdrivers. You'll need a Phillips screwdriver and a regular screwdriver. Even in today's high-tech helicopter kits, you'll find some screws, i.e., in the servo installation. I have two sizes of each type of screwdriver, and I use them regularly. Nothing ruins a screw head faster than a worn screwdriver blade or one that doesn't fit the recess. The best screwdrivers I've found are made for gunsmiths. The blades are parallel-ground, which make them less likely to pull out of the slot as pressure or torque is applied.



The old standbys—X-Acto knives and razor saws.



A selection of Allen wrenches and hex ball-drivers will be welcome additions.

PHOTOS BY JERRY HICKS

TOOLING UP FOR HELIS

Ball link. Also high on my list is a ball-link tool that pops the link ends on and off the balls as the heli is assembled and adjusted. One type will remove links, and another will remove and install them. Use GMP's* ball-link tool to install and remove the links. Rave's* makes a removal tool that has a concave "pad" on the pressure side to center the ball in the fork side so that the link can be popped off the ball without scratching the ball itself.

Link driver. With a link driver, you can install the link on the pushrods without damaging them. (Don't try to spin them on by finger pressure alone—it hurts!) I have Rave's hand-driven version and their power driver, which fits my cordless electric driver. With these two tools, you can install the links without distorting them.



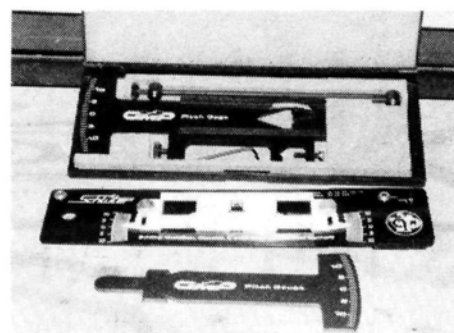
Here's a perfectly static balanced tail rotor. Note that each blade is the same distance above the work surface. High-Point balancer does the trick.

Pliers. I have several types of pliers in my toolbox: small needle-nose, curved needle-nose and combination pliers. Don't tighten nuts with them; don't turn bolts with them; and don't use them

to hold parts that you're painting. Use them to hold a nut in a tight place while the first threads of a bolt are turned into it and to put slight bends in non-threaded areas of certain linkages.

Die. To make replacements or to change lengths, use a die for cutting threads on pushrods. Miniature Aircraft Supply* has a great 2mm die that's molded into a plastic handle. Easy to use, it cuts clean, even threads. Keep bulk pushrod stock in case you over-bend them.

Razor knife. You'll need this knife for a variety of jobs, i.e., trimming wooden parts, trimming molding flash from plastic pieces, and fitting the canopy. There are many brands and most work well. A blade is either sharp or it isn't. I have three blade handles in my toolbox: the standard lightweight, thin-aluminum type for light cutting; one with a cushioned handle for detailing; and the large, industrial-strength type for heavy cutting. The last item accommodates the larger blades as well as the razor saws, and I use them all extensively.



Essential to proper blade set-up, a variety of pitch gauges are available.

(Continued on page 128)



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SPORTY SCALE

TECHNIQUES

by FRANK TIANO

The AMA "matrix rule," documentation and "tray bien"!

EVER HAVE one of those days when everything that can possibly go wrong actually does? Yeah, me too—only it was a whole dang week that was filled with one irritating or disappointing thing after another.

Mind you, on a scale of one to 10, none of them deserved an annoyance score of more than a six, but when you start stringing them all together, they top out at something more like a 12!

FRANKLY, HE'S MIFFED

At the top of my list of gripes is all the nonsense and controversy about the new AMA scale rules. We belong to the AMA for many reasons, one of which is a fabulous insurance policy; another is that it provides a set of rules to live by (or, at least, to model by).

A while ago, some dedicated scale modelers went to the AMA and said something like this: "A very small number of us would like to compete in some sort of scale contest. We won't burden you with making any rules; we'll take care of that ourselves. We really believe that after enough scale modelers have had their fill of just flying around the sky at their local field, some might want to try this sort of competition to improve their skills.

"We have no desire to conflict with any other facet of the sport; we just want to have a set of rules under

which we can all compete. For those who enjoy scale modeling but haven't yet acquired the skills to compete, there will be an entry-level form of scale competition, called 'Fun Scale,' where the emphasis is on flying.

"As in any other form of competition, the rules may be a bit stringent. If they weren't, it wouldn't be a competition, would it? So, Mr. AMA director, what do you think?"

With this scenario fresh in your minds, I must ask one or two all-important questions. Why do the least-skilled model builders—the ones who carve balsa with an axe, sand it with a cheese grater and paint with a roller—always try to force their wishes on those who want to compete? Why do people who don't always fly try to make rules for those who do?

It's as if these people want to relax the rules of competition drastically enough to increase their chances of winning. They get on their soapboxes with their self-serving rhetoric and say, "This is what the scale modeling community really wants."

Well, let me tell you something, buster: I don't believe that the average modeler wants to go to a scale competition to look at a bunch of mediocre airplanes flown by even lesser pilots who seem to have a bagful of excuses for why they crash the last five out of six rounds. *Competition is*

CHECKERBOARDS THE EASY WAY

LAST MONTH, I promised to show you how Charlie Chambers did the sliding-canopy thing on his award-winning Mustang, but I must apologize, because I don't have the photos, but you *will* see it next time. Instead, I offer a picture of Charles and me laying out the parallel lines for the checkerboard pattern on his new Platt P-51 in "Beautiful Doll" colors.

We stood the 'Stang on its nose on my perfectly flat glass-topped table. We made sure that we had enough room to rotate the fuselage 360 degrees and that we had clearance to move our special lining tool around the circumference of the fuselage. The lining tool is merely a flat, hard piece of 1/4-inch plywood with a 10-inch piece of 1/2x3/4-inch maple Zapped to it at exactly 90 degrees. (In fact, Charlie even Zapped the plastic triangle to the wood to make absolutely sure that the maple was at 90 degrees to the workbench surface.)

We then Zapped a pencil to the upright at a predetermined point and rotated either the fuselage or the tool to scribe a perfect line all around the fuselage. To lay out the next line, we simply moved the pencil to the next division line and scribed again. When we had finished, the fuselage had perfectly spaced pencil lines all around to allow Charlie to lay out his checkerboard pattern perfectly!



Charlie Chambers and Frankie T. try out new checkerboard painting jig during the rework of Charlie's Top Gun '51. Technique much easier than the long-discontinued Robart checkerboard paint in a spray can.

just that—it isn't supposed to be easy! I don't know of any sport in which a competitor who has never trained a day in his life has the same chance of winning as one who has spent grueling hours in training! Why is it always the incompetent, fumbling idiots who try to make life miserable for the true enthusiasts?

A word of advice to all of you who feel the shoe is beginning to fit really well: *give us a break!* Scale modelers are scale modelers. Some will always be a little more dedicated, and some will always turn out better models, but I've never seen the superb model builder turn his nose up at a less-skilled club member.

If you persist, you just may find that there won't be any more skilled craftsmen at the contests, or new airplanes to gawk over, or new designs from that kit manufacturer you drove away with your nonsense. What *will* be there is you and others like you—and can you imagine how boring and uninteresting scale modeling could quickly become?

TRAY CHIC?

I thank Colonel Stunning for letting me vent my spleen; this has been eating at me for quite some time! Speaking of eating, I went on a diet and lost 12 pounds just so I could feel more comfortable about the way I look in the latest designs in transmitter trays. That's right, ever since Bob Violett let me try on his tray last year, I've been searching for a tray that fits me like his custom one fits him. Well, here's some good news.

L.A.W. Racing Products* has released its new tranny tray—and it's a work of art! This thing is comfortable,

Transmitter tray from L.A.W. Racing Products is now more accepted among scale fliers. European pattern fliers have been using them for years. Tray allows more precise control by removing weight of transmitter from hands.



holds the transmitter securely, is fully adjustable and even has spring-loaded arms to make it easy to put on and take off. Safety and comfort go hand in hand. A special clip holds your transmitter tightly in place, so you can reach all the control levers and dials without fear of losing control. Best of all, it can be ordered with extra long arms to fit the most robust of us. I guess it's pretty obvious that I really like mine. No, it isn't a commercial: I paid almost a hundred bucks for the thing, and I think it could be worth a little more!

6 1/2-FOOT TIGER

Many of you wrote to ask where Wild Bill McCallie got his P-40. I'm going to answer you all at one time, so get your pencil and paper ready. Jerry Bates* sells the complete plans for the very same 80-inch P-40 that you saw Jack Dorman and Dr. Bill fly at the U.S. Scale Masters in St. Louis. The plans are very well done, and a canopy and a cowl are also available. Jerry even offers a way to install exact scale landing gear in the thing with just a few nights' work! If you've been waiting for a P-40, jump on this one—it's *that* good.

DOCUMENTATION GOLD MINE

From time to time, I come across a book that I think would make a welcome addition to any scale modeler's collection, and this is one of those times. *Aces and Wingmen II*, by Danny Morris, is available from Aviation Usk* for \$39.95 (plus \$4 shipping). It's loaded with information on the Eighth and Ninth Air Forces. More than 700 black-and-white photos and 56 color illustrations show various well-known fighter pilots and their wingmen's airplanes.

The text covers individual accounts of 13 pilots, group histories, and squadron and personal markings for the aircraft. It's a great book to have around when your flying buddies come over. Charlie Chambers grabbed mine, and it took me a week to get it back! You'll find the book interesting, and there might be some colors and markings you haven't seen before.

FURY AS FRANK

This month's photo gallery includes a shot of Brian O'Meara's first scale effort since he graduated from the



For scale fans, new book by Danny Morris presents colors of subjects not usually seen. See text for more info.

Garland Hamilton School of Scale Modeling. Brian no longer uses that dull chisel and old switchblade knife. Gone are the ball-peen hammers, the rusty vice grips, the sixpenny nails and the cardboard ruler; they've been replaced by Griffen tools, new painting techniques, unsmudged canopies and honest-to-goodness rivet detail. Bri tells me that I shamed him into going to Garland's new school after he read one of my articles about craftsmanship and how to go about getting some! Anyway, the new Zero is ready for Top Gun and it looks magnificent. It has just the right amount of weathering and

PHOTOS BY FRANK TIANO



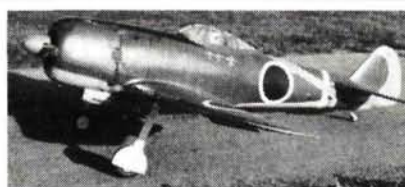
Close-up of rivet and surface detail on Brian O'Meara's S.T. 2500-powered Platt Zero. Ready for the Top Gun Invitational, it weighs 19 pounds.

SPORTY SCALE TECHNIQUES

(Continued from page 105)

scale detail—even the pilot looks rather realistic.

Next are some photos of Don Smith's* Hawker Sea Fury and my KI-84 "Frank" built from Don's plans. These were taken the day of both birds' initial flights—and both came off without a hitch! The Fury weighs 28 pounds, and the Frank is a hefty 32 pounds, but the Webra Bully (with the Barton manifold and the O.S. 8BI carburetor) turned the Zinger 18x8 at an easy 8500rpm. It had more than enough poke to fly both ships very realistically. The Fury will be flown at Top Gun in Team Scale, but the Frank is being saved for the Masters, assuming I



Señor Sporty Scale's new Nakajima KI-84, appropriately code-named "Frank." Full-scale version outran Jugs and Mustangs in WW II!



Don Smith's Hawker Sea Fury. This Webra Bully-powered 29-pounder spans 86 inches; solid flier.

can get out there this year.

Well, that's it for this month, scale fans. By the time you read this, Top Gun will be over and Stunning will give you a full report. Until next time, I'd like to pass along a few things for you to remember if you

want to succeed in this wonderful sport.

● It's only a rumor that Steve Helms is offering optional fog lights on the new Futaba 1024 for pilots in the Los Angeles area.

● You don't have to wait until next January to buy your

1991-legal radio.

● Putting extra-large springs around your wing bolts before assembling your airplane won't produce the same effect as shock-absorbing landing gear.

● Norm Berger's B-57 induction kit will *not* retrofit into Mark Frankel's Lear.

● Never, ever forget to check your six!

*Here are the addresses of the companies mentioned in this article:

L.A.W. Racing Products, 1229 Capitol Dr., Addison, IL 60101.

Jerry Bates, 102 Glenwood St., Mobile, AL 36606.

Aviation Usk, 602 Front St., Box 97, Usk, WA 99180.

Don Smith Plans, 2260 N. Dixie Hwy., Boca Raton, FL 33431. ■

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QUIET FLIGHT

(Continued from page 58)

channels with elevon mixing (three with optional flaps). It spans 44 inches and has a wing area of 2.7 square feet. Like all VS kits, the workmanship of the Zulu's component parts is superb. It comes with a beautiful fiberglass fuselage, pre-sheathed, blue-foam-core wings and sheet-balsa tail surfaces.

Robbe Model Sport*

Two of Robbe's new models were of particular interest to me. One was the Micro Racer, which is intended for electric, 7-cell pylon racing. This hot-looking little ship is all wood, and the kit includes a 540S motor, a prop and a spinner. The model spans 32.8 inches and requires three channels for aileron, elevator and motor control. Now that several electric pylon kits are hitting the market, I hope we'll see a resurgence of interest in this area.

The other interesting Robbe model was the Saphir thermal glider. I couldn't get much info on this ship, as the model at the show was the first kit to arrive in the U.S., but as you can tell from the picture, it's very pretty. It has foam-cores and a fiberglass fuselage, and it looks slightly bigger than 3 meters. I'm fairly sure that it will have rudder, elevator and aileron control—possibly with spoilers or flaps for glide-path control. I'll keep you posted as I learn more, as this will probably be a popular high-performance model.

Obviously, there were more things to see than I can describe here. Keep an eye on the ads, and I'll let you know of new products as I get information on them. It looks as if it will be a banner year for "quiet flight"!

Till next time...good thermals and a full charge.

*Here are the addresses of the companies mentioned in this article:

Tobby Lobby International, 5614 Franklin Pike Tr., P.O. Box 285, Brentwood, TN 37027.

Composite Structures Technology, P.O. Box 615, Lancaster, CA 93539.

Teck-Polymers, P.O. Box 2498, La Mesa, CA 92044.

UCU, 1556 S. Anaheim Blvd., Unit C, Anaheim, CA 92805.

Lobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.

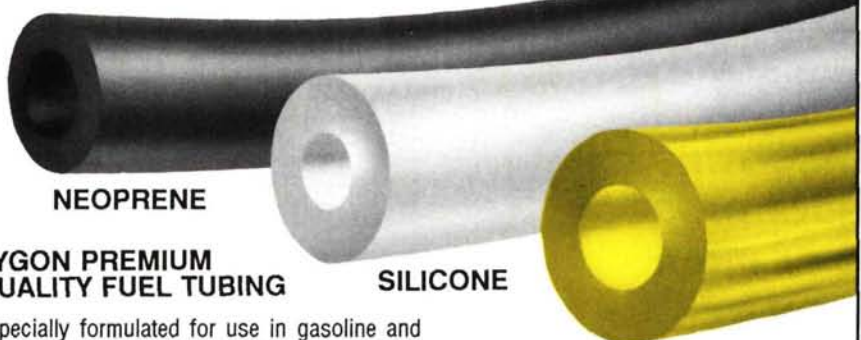
ilidesigns, 3184 Lynn Ct., Newbury Park, CA 91320.

Liff Hanger Models, P.O. Box 9081, Torrance, CA 90508.

S Sailplanes, 2317 North 63rd, Seattle, WA 98103.

Robbe Model Sport, 180 Township Line Rd., Belle Mead, NJ 08502.

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| 37 | Deiav Comet Race | 22"x20" | 32"x32" | 66"x44" | 66"x44" | 66"x44" | 66"x44" | 66"x44" |
| 40 | Vought Cors F4U | 20"x20" | 30"x26" | 60"x45" | 60"x45" | 60"x45" | 60"x45" | 60"x45" |
| 15 | Coucou Jenny | 21"x18" | 32"x24" | 65"x38" | 65"x38" | 65"x38" | 65"x38" | 65"x38" |
| 16 | Standard J-1 Tr | 22"x22" | 32"x30" | 65"x45" | 65"x45" | 65"x45" | 65"x45" | 65"x45" |
| 29 | Waco Taper-Wing | 15"x14" | 22"x20" | 45"x34" | 60"x48" | 70"x62" | 70"x62" | 70"x62" |
| 36 | Westland Lysander | 25"x18" | 37"x24" | 75"x38" | 100"x52" | 100"x52" | 100"x52" | 100"x52" |
| 35 | Doug O-46-A Obse | 23"x24" | 34"x32" | 68"x46" | 68"x46" | 68"x46" | 68"x46" | 68"x46" |
| 29 | Boeing 100 Sport | 15"x16" | 22"x24" | 45"x30" | 60"x48" | 90"x62" | 90"x62" | 90"x62" |
| 33 | Stin A Trimotor | 30"x30" | 45"x38" | 90"x62" | 90"x62" | 90"x62" | 90"x62" | 90"x62" |
| 39 | Lock Lightning F38 | 27"x19" | 39"x26" | 78"x45" | 78"x45" | 78"x45" | 78"x45" | 78"x45" |
| 38 | Con Catina PB5a | 52"x48" | 78"x60" | 104"x72" | 112"x56" | 112"x56" | 112"x56" | 112"x56" |
| 25 | Vgt Cors O2U-1/4 | 18"x20" | 27"x28" | 54"x40" | 72"x56" | 108"x68" | 108"x68" | 108"x68" |
| 19 | Curtiss NC-4 | 62"x66" | 94"x89" | 126"x108" | 126"x108" | 126"x108" | 126"x108" | 126"x108" |
| 17 | Fokker D-7 Ftr | 14"x12" | 21"x16" | 42"x30" | 42"x30" | 42"x30" | 42"x30" | 42"x30" |
| 31 | Bayles Gee-Bee | 11"x12" | 17"x14" | 35"x32" | 47"x44" | 70"x56" | 70"x56" | 70"x56" |
| 13 | Supermarine 5.6B | 15"x10" | 22"x13" | 44"x32" | 60"x38" | 89"x52" | 89"x52" | 89"x52" |
| 36 | Grum "Gullhawk" | 14"x14" | 21"x18" | 43"x38" | 43"x38" | 43"x38" | 43"x38" | 43"x38" |
| 35 | Lock Electra VII | 27"x25" | 41"x32" | 55"x38" | 68"x48" | 84"x56" | 84"x56" | 84"x56" |
| 43 | Grum avenger TBF | 30"x28" | 40"x38" | 80"x52" | 80"x52" | 80"x52" | 80"x52" | 80"x52" |
| 42 | Boe B17G FlyFort | 51"x40" | 77"x52" | 102"x72" | 102"x72" | 102"x72" | 102"x72" | 102"x72" |
| 38 | N Mitchell B-25 | 36"x37" | 55"x52" | 70"x52" | 70"x52" | 70"x52" | 70"x52" | 70"x52" |
| 34 | Macci-Castolm72 | 15"x15" | 23"x22" | 46"x35" | 46"x35" | 46"x35" | 46"x35" | 46"x35" |
| 37 | Cue Navy SUC-1 | 19"x18" | 28"x24" | 57"x36" | 57"x36" | 57"x36" | 57"x36" | 57"x36" |
| 25 | C. Kacer B3C-1 Az | 11"x15" | 16"x20" | 33"x30" | 33"x30" | 33"x30" | 33"x30" | 33"x30" |
| 34 | Doug Transp DC-3 | 47"x40" | 71"x50" | 102"x72" | 102"x72" | 102"x72" | 102"x72" | 102"x72" |
| 33 | Curt Hawk P-6E | 15"x15" | 23"x22" | 47"x34" | 47"x34" | 47"x34" | 47"x34" | 47"x34" |
| 32 | Doolittle GB911 | 12"x17" | 18"x22" | 37"x35" | 49"x46" | 74"x58" | 74"x58" | 74"x58" |
| 31 | Boe F4B-36A P12B | 15"x16" | 22"x20" | 44"x32" | 59"x44" | 89"x58" | 89"x58" | 89"x58" |
| 32 | Sprfld Bull-Dog | 13"x16" | 20"x20" | 40"x32" | 40"x32" | 40"x32" | 40"x32" | 40"x32" |
| 32 | Howard IkeMike | 10"x12" | 15"x15" | 31"x26" | 31"x26" | 31"x26" | 31"x26" | 31"x26" |
| 34 | Turners WW Racer | 13"x12" | 19"x16" | 39"x28" | 52"x40" | 78"x52" | 78"x52" | 78"x52" |
| 35 | How Mr. Mulligan | 16"x15" | 23"x20" | 47"x32" | 64"x44" | 94"x56" | 94"x56" | 94"x56" |
| 33 | Boe P26A Low Wng | 14"x15" | 21"x20" | 42"x32" | 63"x45" | 84"x58" | 84"x58" | 84"x58" |
| 35 | Stinson T6A-1 | 20"x18" | 31"x25" | 62"x45" | 82"x55" | 103"x66" | 103"x66" | 103"x66" |
| 42 | DH Mosquito Bomb | 37"x24" | 41"x35" | 81"x50" | 81"x50" | 81"x50" | 81"x50" | 81"x50" |
| 37 | Stearman PT-17 | 16"x18" | 24"x22" | 49"x38" | 49"x38" | 49"x38" | 49"x38" | 49"x38" |
| 43 | N Bk Widow P-61 | 33"x40" | 49"x50" | 99"x75" | 99"x75" | 99"x75" | 99"x75" | 99"x75" |
| 30 | TAM Hawk Tex-13 | 14"x13" | 21"x18" | 43"x36" | 43"x36" | 43"x36" | 43"x36" | 43"x36" |
| 42 | C. H. H. H. H. H. H. | 25"x25" | 37"x35" | 74"x60" | 74"x60" | 74"x60" | 74"x60" | 74"x60" |
| 26 | Ford Trimotor 4AT | 38"x38" | 57"x49" | 114"x72" | 114"x72" | 114"x72" | 114"x72" | 114"x72" |
| 31 | Bellanca Air Bus | 32"x22" | 48"x30" | 96"x52" | 96"x52" | 96"x52" | 96"x52" | 96"x52" |
| 33 | Grum J2F Duck | 19"x28" | 29"x40" | 58"x55" | 58"x55" | 58"x55" | 58"x55" | 58"x55" |
| 27 | C. Seahawk F7C-1 | 15"x18" | 23"x24" | 47"x38" | 63"x50" | 94"x58" | 94"x58" | 94"x58" |
| 28 | Sik Amphib S-38 | 36"x34" | 54"x42" | 108"x76" | 108"x76" | 108"x76" | 108"x76" | 108"x76" |
| 16 | He-Pge O-400 Bomb | 50"x45" | 75"x60" | 150"x90" | 150"x90" | 150"x90" | 150"x90" | 150"x90" |
| 31 | Lindy's L-5 Sirius | 21"x16" | 31"x22" | 63"x46" | 63"x46" | 63"x46" | 63"x46" | 63"x46" |
| 31 | Howard Rac-Pete | 10"x12" | 15"x15" | 30"x30" | 30"x30" | 30"x30" | 30"x30" | 30"x30" |
| 31 | C Sparhawk F9C-2 | 12"x15" | 19"x22" | 38"x35" | 38"x35" | 38"x35" | 38"x35" | 38"x35" |
| 33 | Aeronca C-3 Pnt | 18"x10" | 27"x14" | 53"x26" | 53"x26" | 53"x26" | 53"x26" | 53"x26" |
| 38 | Turners Penco Sp | 12"x18" | 18"x20" | 37"x38" | 47"x48" | 74"x56" | 74"x56" | 74"x56" |
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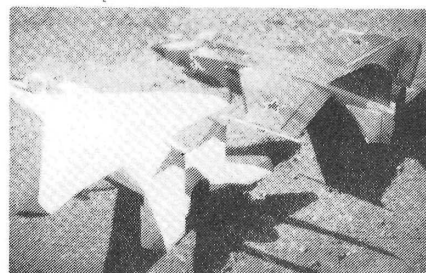
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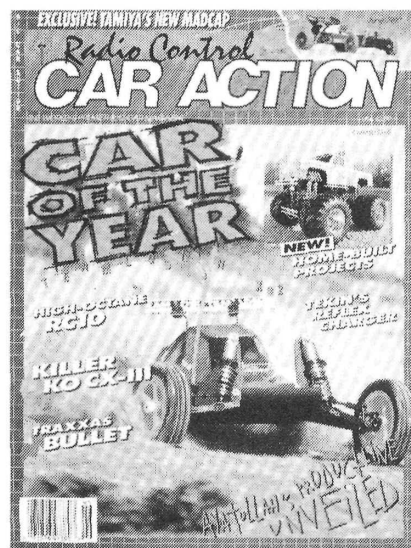
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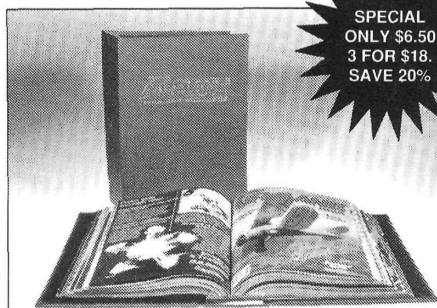
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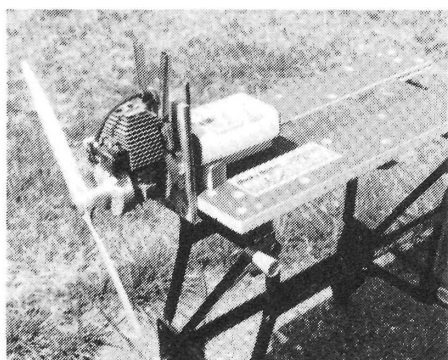
Air Age Mail-Order Services, 251 Danbury Rd., Wilton, CT 06897

L O N ' S FLIGHT- MATE

Tailoring an already versatile tool to the needs of modelers

by LON TURNER

ONCE IN A WHILE, something comes along that improves our lives so much that we wonder how we ever got along without it! To those of us old enough to have built models with Ambroid, Testor's, or Duco cement, 5-

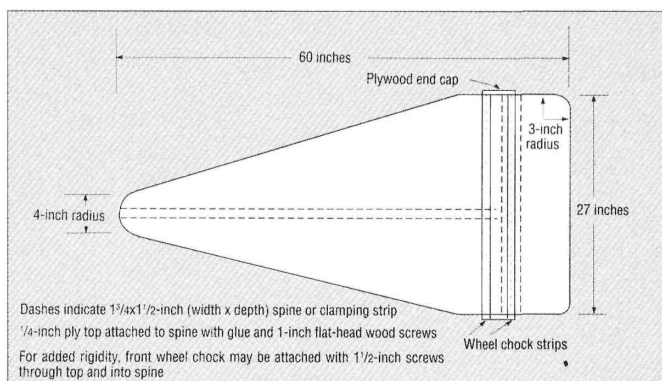


An engine test stand with mount clamped into the Workmate's jaws.

minute epoxy was a dream come true. Now, CA has become the ultimate adhesive: it's stronger than wood, it sets instantly, and it weighs next to nothing.

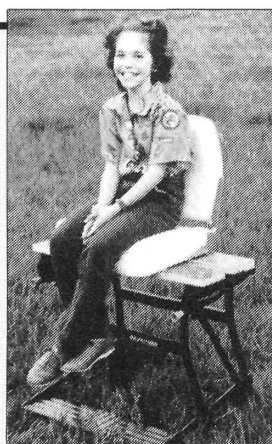
Black & Decker's Workmate is another "flash of genius." This gadget is one of the most useful, versatile tools I've ever seen. The really ingenious part of the Workmate is its top surface, which opens and closes like a vise or clamp through the use of twin screw mechanisms. Its ability to grip objects, combined with its dual height positions and folding ability make it incredibly

useful to model builders. The photos show just a few of the uses I've discovered for this terrific tool. You'll never run out of



ideas for this thing. I certainly haven't—I just bought a second one!

I came up with the idea for the Flight-Mate shortly after I started building and



Granddaughter Genny finds the adapted seat a comfortable vantage point.

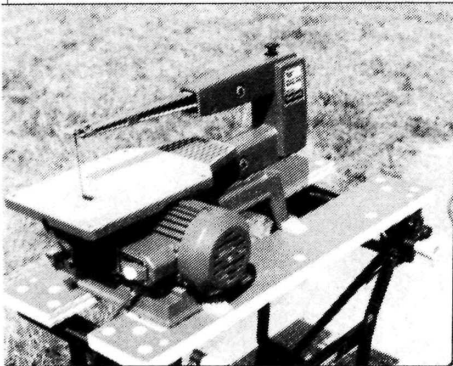
FLIGHT-MATE'S SEAT MATE?

Most of us have to pack a folding chair if we want to sit while at the field. Even though folding chairs can be very light, they often take up a lot of our limited transportation space. Most aren't very durable, either.

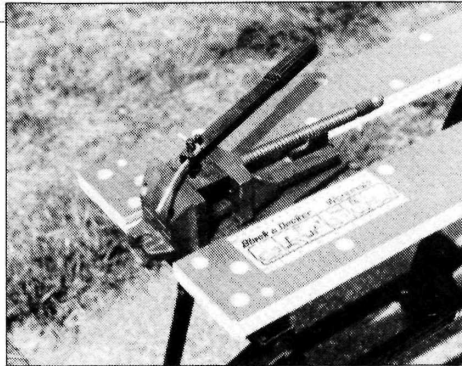
Sporting-goods stores and catalogues sell boat seats that are nothing more than a padded seat and back, hinged together so that they fold into a small, light, cube-shaped unit. The cheaper ones have a plain plywood bottom, while some have a swivel mechanism already mounted. If you want your chair to rotate, bolt a clamping strip to the swivel base. I prefer to epoxy a clamping strip directly to the plywood bottom, as shown in the photo. (If you wonder why I didn't just screw the strip to the bottom, I'm sure you'll get the point later!)



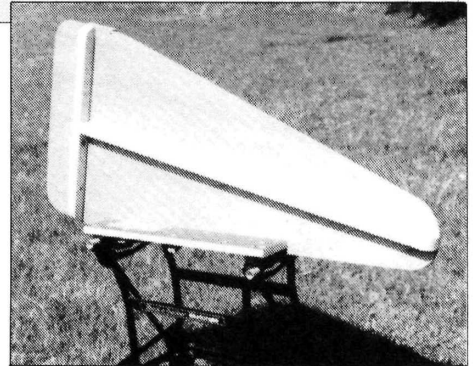
Folded boat seat with clamping strip attached.



Using plastic clips provided, the Workmate firmly grips most bench tools.



Here, the Workmate holds a vise that grips the K&S Mighty Wire Bender.



Bottom view of Flight-Mate tabletop held securely for photographing.

flying giant-scale planes. My favorite subjects are planes from WW I and the following early years of aviation. Planes from this era use lots of wires, turnbuckles and struts, and they must be rigged and unrigged at each flying session.

My home field has permanent tables that make preflight checks and servicing easy; but many fields don't. At an out-of-town meet, I discovered that crawling around on the ground wasn't easy for a man of my years and weight. I doubt any of you enjoy that part either, even if you aren't (or won't admit to being) as old or as fat as I am.

What I needed was a portable table that was sturdy enough to hold a heavy, giant-scale airplane, yet small enough to fit into a mid-size wagon.

The B&D Workmate came to mind almost immediately. All I really needed was a specialized tabletop that would clamp into the jaws of the Workmate. The tabletop would have to be cheap and light, yet sturdy and twist-resistant.

The drawing shows how I approached the problem; it isn't the only way, however, and you can modify it to suit your own requirements.

The only feature I consider essential is the T-shaped spine that clamps into the Workmate and securely holds the 1/4-inch plywood top. To prevent twisting, the spine should be 1 1/2 to 2 inches wide, and 1 1/2 inches deep so that it doesn't bottom-out against the frame. The plywood top should rest flat on top of the jaws. To install, drop the clamping strip into the opening, slide the top back until the cross-trip butts up to the jaws, and tighten both crews to lock the top in place.

I chose these dimensions by measuring the widest landing gear and longest fuselage that I currently fly. This enables me to use the tabletop with almost any plane I own. You can do the same, or you might

even choose to make a custom top for each project.

I mostly fly tail-draggers, but that isn't the only reason I chose the triangular shape: I wanted to eliminate the possibility of someone (me!) trying to sit or lean on the big, unsupported corners that would have remained at the tail end. Also, my current airplane is so long that I have to angle it to fit it into the wagon: a rectangular top wouldn't have angled well.

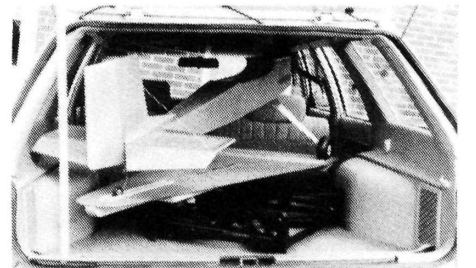
To prevent splintering, I rounded the edges of the plywood with a razor plane and sandpaper. I also rounded the ends of the spine so that the tabletop slides into the wagon easily.

Just to be fancy, I chamfered the inside edges of the wheel-chock strips. Plain square strips would be easier to make and might work even better. The 1/8-inch ply caps on the ends of the wheel channel prevent the wheel from slipping off sideways.

The Workmate's jaws operate even when it's folded, so it can be put in the wagon first, then clamped to the tabletop, to which the fuselage is attached. This takes up only a little additional room and makes for a secure travel setup. I'd had problems with planes rolling back and forth while I drove, but a few well-placed screw hooks and some no. 64 rubber bands turned the Flight-Mate tabletop into a great transporter!

There are a few different models of the Workmate available from Black & Decker, as well as copies by other companies. All versions will probably work, but the original model by Black & Decker is stronger, has a wider stance and offers a dual height capability.

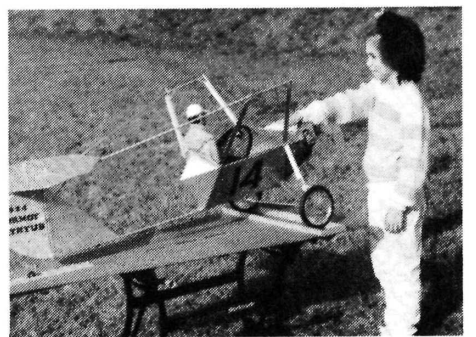
The Workmate and its lookalikes are relatively expensive, but watch for sales. I found my second one at a local salvage store. It was perfect, but the box was a disaster. I grabbed it for \$30.



Inside view Dodge Aries wagon. Roadrunner rides on table that's clamped into folded Workmate.



Workmate folded for transportation.



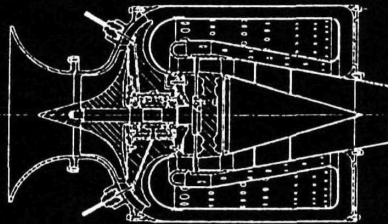
Workmate set at lower height for Genny's use.

You'll really appreciate this clever gadget. In fact, you'll probably dream up uses that haven't even occurred to me. How about passing them along to me (in care of MAN) along with any modifications to the Flight-Mate top that might make it more versatile? I hope Black & Decker's Workmate and my Flight-Mate tabletop will help make your flying sessions much more enjoyable. ■

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REGAL EAGLE

(Continued from page 73)

The triangular stock will allow a much more rounded—almost circular—nose like that on the full-size F-15.

The intakes on the stock Regal Eagle are flush with the top of the fuselage. At certain angles, this lends the Eagle a MiG-25 Foxbat look, so, like those on the F-15, the tops of the intakes should slope below the top surface of the fuselage. Always be careful to provide a tuned-pipe cooling slot on the inner surface of the intake.

Many R/C jet pilots think that retracts are necessary, and the Regal Eagle plans suggest an installation for them. Because there will be a great load on the gear (especially if the plane flies from a grass field), the main-gear retract plates should not only be glassed into place, but some carbon-fiber reinforcing strips should also be strategically placed to keep the bottom fuselage section intact.

FINAL FEATHERS

Editor Rich Uravitch takes over

The Regal Eagle arrived roughly sanded, but completely assembled. I soon discovered that this wasn't a particularly small airplane, and moving it around in the workshop was a real challenge. The fact that it's a "one-piecer" didn't help much either—especially when it came to finishing. To reduce the time and effort required, I first covered the entire airframe with Top Flite's* clear MonoKote, which can be painted. Then I scuff-sanded with 400-grit sandpaper, wiped the surfaces with thinner and then sprayed on a lacquer primer. Another light sanding was followed by a final wipe with a tack-rag.

READY FOR COLOR

If you've been collecting documentation as long as I have, you'll probably figure that despite the relative newness of the F-15, there should be something more exciting than "lo-viz" grey finishes—right? You're wrong! Apart from the MacDouglas demonstrator with the Thunderbird-type scheme; the multi-hued, natural-metal skin of the Streak Eagle project bird and the early test airplane with the Day-Glo accents, there isn't much!

I shot two coats of blue/grey lacquer over everything, then masked off the Day-Glo Orange and applied it straight from the Krylon* spray can. For the sake of visibility, I took some liberties and also shot some around the nose. I drew panel

(Continued on page 116)

REGAL EAGLE

(Continued from page 114)

lines with a drafting pen, fuel-proofed the entire engine compartment with Pacer* epoxy finishing resin, and sprayed two coats of Hobbypoxy* Satin Clear over the exterior to fuelproof the lacquer and impart an overall uniformity to the finish.

Starting with the modified Byrojet unit driven by the mighty Rossi*.81, I reinstalled all the radio and fan components. Although no longer in production (replaced by the even mightier .90), the Rossi .81 is one of my favorite powerplants when coupled to the Byron fan unit. Next came the SpringAir* retracts and the World Engines* 7-channel Expert radio. Little else was needed, except for blue skies and blacktop.

THE EAGLE SOARS

The right day finally arrived, so, after an at-home preflight, I headed to the field. It's absolutely amazing how impressive a little preparation can make things! Having done my "home"-work, I performed the customary range check, refueled the Eagle, pumped up the retracts, turned on the radio, lit the plug, hit the Rossi with

the starter and taxied out. Boy, ain't this jet stuff easy?

I was immediately impressed with the Eagle's acceleration. After a ground roll of approximately 150 feet, it was airborne, and it was at about 100 feet as it crossed the departure end of our 320-foot runway. Climb-out was positive, so I set up for a number of trim circuits. A little nose-down trim and some left aileron was all that was required; gear up or down made no discernable difference.

I couldn't see any bad habits anywhere in the Eagle's broad speed range, and I estimate its high speed to be approximately that of a high-performance pattern ship—perhaps 115 to 125mph. It was certainly enough to be impressive, but manageable by sport fliers.

The area in which the Eagle *really* shines is the approach-speed regime. It slows beautifully and, in a slight headwind, all that wing allows you to set up a constant nose-high descent right down to the runway. The narrow gear makes crosswind taxiing a chore, and the combined area of the twin vertical fins promotes "weather-vaning," which goes unchallenged owing to the absence of functional rudders. These problems are, however,

bearable and really more worthy of note than of discussion.

So, what does the Regal Eagle represent?—an attractive, easy-to-build, balsawood-and-foam, ducted-fan sport airplane, that's what! The instructions are sparse (perhaps you should get the companion video); the parts fit is acceptable, but far from perfect; and the material is of an adequate quality. But the Regal Eagle is *not* a megabuck, fiberglass, scale machine, either! The choice of the Byro-Jet fan unit makes sense because it's inexpensive, and although it's somewhere around the trailing edge of current fan technology, its simplicity and demonstrated performance ability are great attributes.

For any newcomer to fans, this Eagle-Byro-Jet combination seems ideal. The Eagle will fly routinely off grass and will forgive all but the most grievous pilot errors. Forget the retracts, couple the nose-wheel steering to the aileron channel, and you have a 3-channel jet. It might not be superfast, but you can comfortably fly right past the bank!

**Here are the addresses of the companies mentioned in this article:*

(Continued on page 120)

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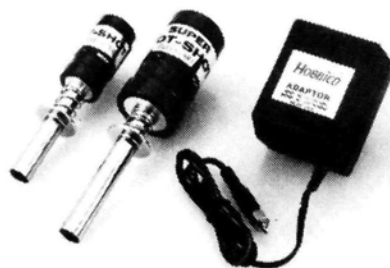
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PRODUCT NEWS

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by *Model Airplane News*, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in *Model Airplane News*.



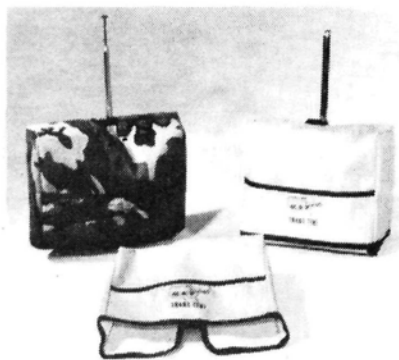
GREAT PLANES Hobbico Hot-Shot & Super Hot-Shot

Hobbico has just introduced two high-quality, rechargeable, glow-plug starters. The Hot-Shot has a positive locking glow-plug clip with an extra-capacity 1400mAh rechargeable Ni-Cd cell for long, continuous use. A reliable wall charger provides overnight charging. The Super Hot-Shot has the same features, but uses a 4000mAh Ni-Cd for extended use and maximum current requirements.

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\$39.95 Super Hot-Shot (no. HCAP2510)

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

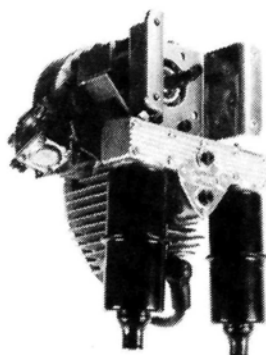


MODEL AVIATION PRODUCTS Trans Tent

Model Aviation Products announces the release of its new radio transmitter dust cover—the Trans Tent, which fits

all radio transmitters. Its inside width is 8 1/2x6 inches, and it has a slit back and Velcro tabs so you can close the rear. The top has a round opening for the antenna. The front has a 2-inch deep pocket, and the full 8 1/2-inch width of the cover is for flags, notes, ID card, etc. Trans Tent keeps transmitters covered at home while charging, and it protects them from the elements when they're in the impound under someone else's care. The top of Trans Tent can be raised easily to check the off/on switch.

For more information, contact Model Aviation Products, P.O. Box 26017, San Bernardino, CA 92406.



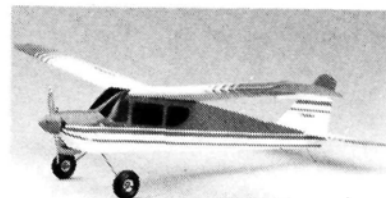
J'TEC Double Snuf

J'Tec offers a new muffler—Double Snuf—for the Zenoah G-38 and Quadra 35 engines. This muffler consists of a special, cast-aluminum manifold and two Snuf-Ler mufflers. It bolts directly onto the engine, and mounting bolts are provided. Its total weight is 12 1/2 ounces. Tests have shown that this muffler greatly reduces engine noise, and the engine runs more smoothly with less vibration and no loss of rpm.

Part no. JT-800Q (Quadra 35); JT-800Z (Zenoah G-38).

Price: \$59.95

For more information, contact J'Tec, 164 School St., Daly City, CA 94014.



ROBBE Bingo

The Bingo is an attractive high-wing plane that's docile and inherently stable. It makes a perfect trainer, because its low flight speeds and good gliding characteristics make landings easy. Controlled with rudder, elevator and throttle, the Bingo is capable of some aerobatics. This plane's all-wood construction uses interlocking die-cut parts. Perfect for beginners, or as a second plane for relaxed flying. Wingspan: 48 inches; length: 39 inches; weight: 42 ounces.

Part no. 3190.

For more information, contact Robbe Model Sport, Inc., 180 Township Line Rd., Belle Mead, NJ 08502.



MASTER AIRSCREW Folding Prop

Greater thrust, improved glide and endurance are gained from using this updated folding propeller for electrics. The revised prop features a light, stamped-aluminum hub and built-in spinner and wide under-cambered blades. Hub length is 2.75 inches, and a .25-inch mounting hole fits the shaft of most popular gearboxes.

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Price: \$8.95; \$9.95.

For more information, contact Master Airscrew, 3219 Monier Circle, Rancho Cordova, CA 95742.



SULLIVAN FLOATPLANE PRODUCTS Havasu Video

This is Sullivan Model's third floatplane video, "The 1989 Havasu Schneider Plus Jimmy Doolittle." The VHS, full-color, 2-hour video takes you on an event-by-event tour of the first giant-scale Schneider Cup re-creation at Lake Havasu, CA. The video contains on-the-spot narration to give you information on the beautiful scale models entered in this historic race, which attracted more than 5,000 spectators.

Price \$26.50 (including shipping & handling)

For more information, contact John Sullivan Model Floatplane Products, 1421 Second St., Calistoga, CA 94515. Phone (707) 942-5095 for credit-card and COD orders.



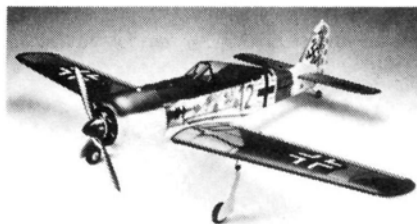
COMPOSITECRAFT Graphite Landing Gear

CompositeCraft now offers the same graphite landing gears that are used by the Kissimmee Cloud Dancer Air Show Team. They come in 1/3 and 1/4 scale.

Part no. 20010 (1/3 scale); 20011 (1/4 scale); 20012 (60-size); 20013 (40-size).

Price: \$46.95; \$39.95; \$23.95; \$23.95.

For more information, contact CompositeCraft, Inc., 2400 Sand Lake Rd., Orlando, FL 32809.

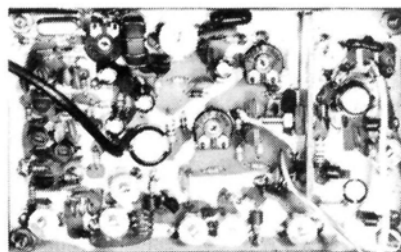


INDY Focke Wulf FW-190 ARF

This stand-off scale Focke Wulf FW-190 comes 92-percent complete. It has a built-up wing with a thin layer of foam-board material. Covered with a thin layer of colored plastic, the plane comes with wheels, tank and spinner, and it's finished in WW II camouflage. The Focke Wulf FW-190 can get you into the air faster than ever before. It has a 54-inch wingspan and requires a 4- or 5-channel radio and a .40 to .50 2-stroke or a .60 to .90 4-stroke engine. Part no. 12042

Price: \$279.95

For more information, contact Indy, 10620 North College Ave., Indianapolis, IN 46280.



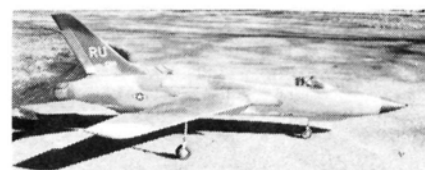
S. BOSE INC. Supercircuits

Here's a tiny TV transmitter with plenty of power. Supercircuits has introduced plans and a construction manual for a 2-watt, 2 1/4x4-inch, 4-ounce color/BW UHF television transmitter. The unit runs on 12 volts and draws 500mA. It includes an audio sub-carrier and tunes UHF 14-20, or the amateur television frequencies. The transmitter has an effective range of several miles, and, on average, it can be built for less than \$100. It has many applications, including aerial work and wireless camera links. It uses both subminiature components and surface-

mount components for excellent RF performance, high efficiency, easy reproduction and construction and simple tune-ups. In fact, the completed unit can be tuned with only a multi-tester and a television receiver.

Price: \$9.95 for complete plans and construction manual, plus \$3 first-class shipping and handling. Plans come with a money-back guarantee.

For more information, contact Supercircuits, 1403 Bayview, Hermosa Beach, CA 90254.



CENTURY JET MODELS F-105 Thunderchief

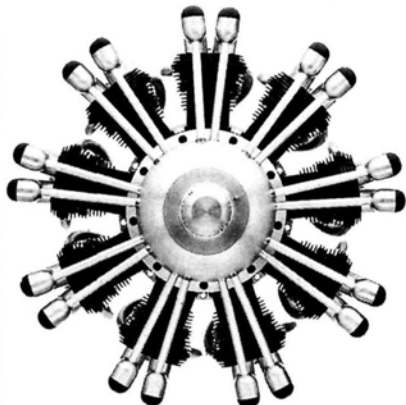
The F-105 is a new addition to Century Jet Models' fleet of ducted-fan jets. This slim, 73-inch fuselage houses a Dynamax Fan with a .77 to .91 DF engine, and it requires no cheater hole. From its full-flying stabs to the dihedral droop in its wings, this warbird looks great. The basic kit contains an epoxy/fiberglass fuselage; an end-grain balsa, carbon-fiber main-wing spar; intake and exhaust tubes; built-in radio and engine compartments; foam wings; horizontal and vertical stabs; a stab-control mechanism; a canopy; easy-to-follow instructions; plans and an illustrated brochure. A construction video is available for a \$15 deposit. The deluxe kit includes pre-cut plywood formers and bulkheads, balsa wood, black and red Nyrods, tires, brushes/gloves, carbon-fiber sheet and much more. Optional accessories and 1/10-scale retracts are also available.

Price: (basic kit) \$239.99. Money-back guarantee.

For more information, contact Century Jet Models Inc., 8 Martha Court, Sumter, SC 29150.

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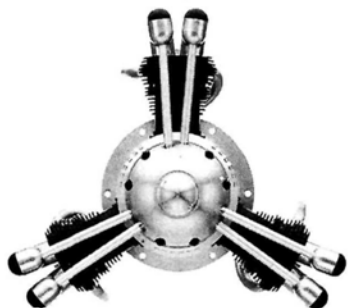
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REGAL EAGLE

(Continued from page 116)

Bob Parkinson Flying Models, 3 William St., Thornton, Ontario, Canada L0L 2N0.

Byro-Jet; distributed by Byron Originals, P.O. Box 279, Ida Grove, IA 51445.

Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.

Krylon; available at hardware stores.

Pacer Technology & Research, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Hobbypoxy; division of Pettit Paint Co. Inc., 36 Pine St., Rockaway, NJ 07866.

Rossi USA, 214 Harvest Ave., Staten Island, NY 10310.

SpringAir Products, P.O. Box 36-1312, Melbourne, FL 32936.

World Engines, 8960 Rossash Ave., Cincinnati, OH 45236.

HIROBO MH-10

(Continued from page 97)

tion four-servo operation as an option.

When the front end of the MH-10 is all hooked up, the sight of three servo wheels hanging below everything but the landing gear does take some getting used to.

Another head-scratcher is which size battery pack to use. The drawings in the instruction book show the installation of one battery pack that's small enough to fit on the servo-tray shelf: 33x54mm, or smaller than 500mAh size—say, 270mAh. To me, this means a fast charge after every flight. Will an 800 to 1200mAh pack be too much for the O.S. CZ-H engine to lift?

The pod-and-boom version of the MH-10 has a canopy that resembles that of the Kalt Excalibur: tall with a chin intake "scoop." The BK-117 fuselage version uses white ABS (polystyrene) for the body, and when I first handled the fuselage sections, I wondered how such a thin shell—no more than .020 inch thick in most places—would hold up. Perhaps I'm spoiled by the recent use of blow-molded, flexible plastics, in addition to the tradi-

(Continued on page 121)

CLUB OF THE MONTH

PATUXENT FLYER PATUXENT AEROMODELERS R/C CLUB

Box 443, Leonardtown, MD 20650

The flying field issue is a thread that runs through club newsletters, and the Patuxent Aeromodelers R/C Club of Leonardtown, MD, is concerned about theirs. The secret to success?—follow safety procedures, and encourage members to help maintain the facilities.

Newsletter Editor Scott Colvin also encourages members to contribute to the newsletter, "The Patuxent Flyer." Former club President Larry Young, who has recently moved back to the area and rejoined the club, has some interesting observations. He was pleased to see that the club had prospered and that the club's membership had grown. He writes: "Some of the guys I taught to fly several years ago are now teaching me." Finding a good flying site was a concern in 1982 when he was president, and it remains a problem today, although it looks as if they might be able to use some State land.

Several members were interested in some friendly competition flying pattern maneuvers. The prize?—pizza. (Hold the anchovies!)

Fun flies are also encouraged, but be advised that some good-natured ribbing comes with the territory. Eight Fun Flies were proposed with gift certificates to be awarded at the end of each set.

Mike Hetrick is in charge of the student training program, and his revised program appears at the end of the newsletter. To help trainees get organized, qualified instructors are listed, along with a preflight and an objective checklist. Also mentioned are the basic tools you should take to the field.

Congratulations, Patuxent Aeromodelers, for being our Club of the Month. Enjoy your two, free subscriptions.

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tional use of fiberglass in .60-size helicopters. It's obvious that the thin ABS makes a lighter fuselage than the other materials would, and watching weight will help the .10-size engine do its job. Because of the smaller moments and areas involved, the thin polystyrene is better suited to a small helicopter.

One outstanding feature of this new Hirobo kit is the inclusion of a page-size, laminated sheet on which there are safety precautions and a preflight checklist. It reminds modelers of what my good friend Ken Nicholson always said: "If it has a motor, it's not a toy." Based on what I've seen of Hirobo's design innovation and manufacturing quality, I'll add that the MH-10/BK-117 wouldn't be a toy, even if it had no motor at all.

PERFORMANCE

I was very eager to start flying the MH-10, but several days of nasty March weather gave me time to establish the more down-to-earth expectations you need for a new design.

Starting the engine requires finesse. When it does fire, if you remove the start shaft before you release the starter switch, you risk launching it from the starter motor and into something fragile—like your foot or the canopy. If you release the switch and then leave the hex shaft engaged for too long before removing it, the mass of the armature will overcome the momentum of the .15-size crankshaft and flywheel, and everything will stop.

The cyclic response of the stock setup was too slow for my taste, even compared with a Shuttle that has large flybar weights, or a Concept with DX paddles. There was a lag between command and response; in fact, it was like having four sticks and eight whiffle balls attached to lampen the tilting movements.

Rotational control felt as though the ail-rotor pitch was getting stuck and wouldn't go back the other way if I used extreme rudder-stick deflections. I wasn't surprised, because I'd noticed a similar "vagueness" the first time I tried a Concept with a one-piece, bearingless tail rotor.

To improve the cyclic "feel," I increased the elevator and aileron throws from the 8mm radii shown in the instructions to 10mm at the servo wheels. This resulted in improved, but still soft, response from the right stick. I plan to try a few more things to firm up the cyclic response:

flybar paddles with more surface area. The CG-corrected paddles from a Shuttle

ZX may get the rotor disc to respond more quickly.)

- stronger and/or faster servos.

I've learned that other MH-10 fliers have noticed a need to improve the tail-rotor response. The one-piece molded tail prop is very stiff in the feathering axis, and this causes the lag after rudder commands. The plastic used in the two-blade unit has a stubborn memory, and it resists the linkage's efforts to flex it. I found that by drilling or cutting out some of the material between the leading and trailing surfaces in the hinges, I made the tail rotor more responsive. Using a beefier servo applies here also, but I've had good results with a 13mm-radius wheel on an S133.

The MH-10 instruction book tells you to have the long arm of the tail-rotor pitch-change lever at 90 degrees to the tail boom when the rudder stick is at neutral. This may result in too little anti-torque pitch at the tail, so at neutral stick, setting the pitch-change lever 15 degrees past (more clockwise of) the right-angle position may help. I got around this by leaving the lever at the recommended position and then trying successively shorter snap links—the white ones in the picture—on my rebuilt tail-rotor pitch slider to achieve a good null stick setting.

When I was comfortable with the control response, I attempted longer hovers and focused my attention on the care and feeding of the .10-size engine. During the next few flights, the MH-10 started to run lean and overheat at the $\frac{2}{3}$ tank mark. I varied the stock idle-mixture screw setting through a range of 60 degrees. I tried 15-, 20- and 25-percent-nitro fuels and different needle-valve settings, yet I still couldn't get a consistent, cool run.

Back at the desk (you don't need a bench to work on an MH-10), I freed the mechanics for a fuel-system inspection by removing six screws and two grub screws at the tail and four screws under the fuselage. When I put the fuel tank into a tub of water, I found a tiny hole near the stopper; this had caused the loss of muffler pressure when the fuel dropped below $\frac{2}{3}$ tank. I decided not to try to fit a rectangular after-market tank; instead, I sealed the stock stopper and its holes, placed the clunk forward and ran the fuel line out through the rear of the tank through a new opening and stopper.

The next time out, the engine stayed cool, but a few things needed attention. The heli was hovering at a throttle-collective stick setting of 75 percent, and I

(Continued on page 124)

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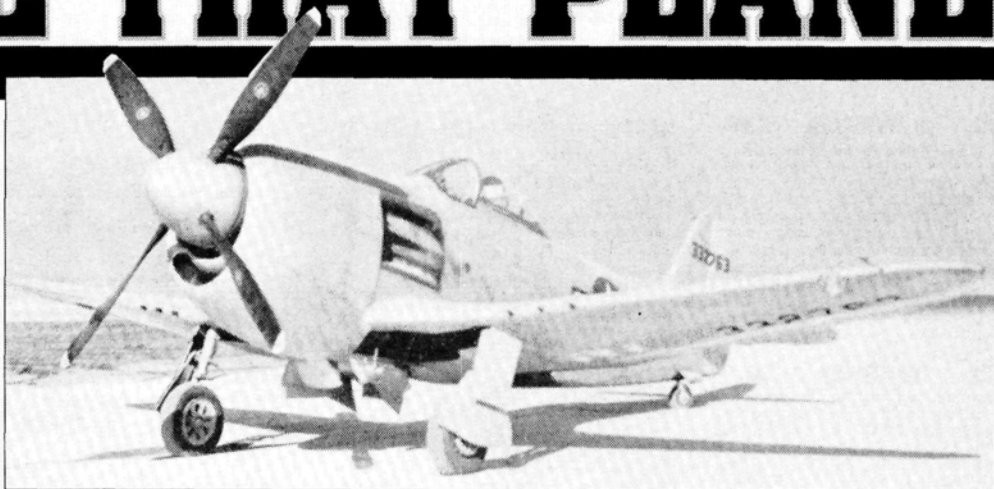
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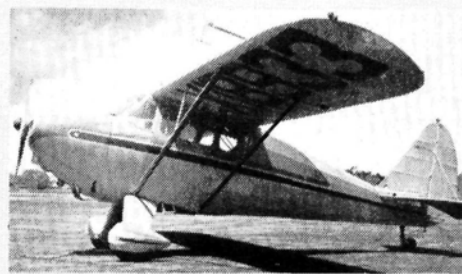


Congratulations to Allen C. Beckhoff of beautiful downtown Burbank, CA, for correctly identifying the Hockaday CV-130 Comet shown in our May 1990 issue. His entry was drawn from the 23 correct answers we received. Quite frankly, we didn't know what the airplane was when we selected it. Among the other guesses? Porterfield Collegiate, Funk and Piper Pacer.

The prototype Comet was first flown in June 1944—hardly the ideal time for leaping into the not-yet-materialized general aviation market. Military trainers, and even fighters, were soon available as “war surplus” and had an adverse impact on virtually any new civilian airplane.

The Comet was a high-wing, two-place cabin monoplane

with the typical wooden wing and welded-steel-tube fuselage of the period. Engine choices were either the 130hp Franklin or the 125hp Continental. With a 33-foot wingspan and a 22-foot-long fuselage, the Comet's max speed was 140mph, it cruised at 130mph and its range was 500 miles.



Four weeks following publication, the name of the winner will be drawn from correct answers received on postcards delivered by U.S. Mail. The winner will receive a free, one-year subscription to **Model Airplane News**, or a free, one-year extension, if already a subscriber.

HIROBO MH-10

(Continued from page 121)

wanted the throttle curve to allow the machine to hover at a setting closer to half stick. Since the O.S. CZ-H carb opens counterclockwise, I advanced the throttle servo wheel counterclockwise one spline and lengthened the pushrod so that the carburetor was 60-percent open when I was at 50-percent throttle-collective stick.

After I had used a few tanks doing some lazy figure-8s to enjoy the new throttle feel, I ran into trouble with glow plugs. Whenever I disconnected the Ni-Cd glow-driver or the power-panel clips, the engine quit. I borrowed every brand of glow plug that was at the field that day, but the undependable idle continued. I finally got airborne again with a stopgap, onboard, glow-current system that uses a C-size Ni-Cd and some alligator clips.

Since this incident, the people at Stanton Hobby Shop and Copter Corner have helped me with their ideas for keeping the MH-10's small engine lit.

- The Stanton advice: Rossi no. 1 (very hot) plug; Go Pop 20-percent nitro; 2 to 2½ turns out with the needle valve.
 - The Copter Corner advice: Fox Miracle or Enya no. 4 (hot) plug; Omega 25-percent nitro; 1¼ to 1½ turns out.
- On the latter needle-valve setting, Andy

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Sutton explains that it gets the power band into the middle rev range to help the engine overcome stalling when the clutch starts to grab. The drive-train layout of the MH-10 limits the size and mass of any flywheel on the engine shaft (remember, there's no fan wheel because the vanes are on the main gear), so it's easy to stop the engine whenever the clutch is less than completely engaged.

In the air, the MH-10 gets your attention—mainly because of the way it sounds. The O.S. CZ-H buzzes with a higher pitch than any other helicopter I've heard. (Does the term "control-line" mean anything to you?) It seems quieter in the hover than when it's just getting light on the skids, probably owing to the small exhaust outlet directing all that high-frequency noise at a paved surface.

After I had sorted out the engine and could run a tank of fuel without landing, I became comfortable with the response of the controls. I'm not surprised that the MH-10 feels like a Shuttle; their respective rotor heads work the same way (single-axle, underslung flybar, moderate Bell-Hiller ratio).

Next, I tried slow forward flight and some reversing turns. Watching the MH-10 fly past close to the ground, I was aware that it's definitely smaller than .30 size. I came back to a hover and nudged the throttle-collective stick forward. The MH-10 popped above the tree line, and it was during this instant of seeing the machine against the sky with no landmarks that I forgot what scale or what displacement it was. It flies like a full-scale helicopter, and—especially in the case of the BK-117 version—it *looks* like a full-scale helicopter. The instant passed, and a smile came on my face because I remembered thinking that about every model helicopter I've hovered above eye level—except that *this one* isn't even three feet long! da Vinci would be proud.

The MH-10 hovers well and has soft control response. It executes mild aerobatics (stall turns, split-S's) very well, but its slow roll rate and weak vertical climb performance (compared with those of larger helicopters) may disappoint some radical hot-doggers. Its diminutive size encourages lots of flying in limited airspace.

The only aspect of the MH-10 that should concern a first-year pilot is operating the finicky .10- to .15-size power-

(Continued on page 128)

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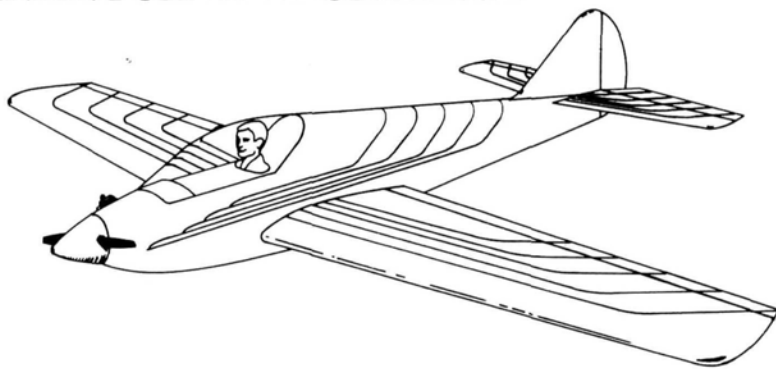
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HIROBO MH-10

(Continued from page 125)

plants. You'll need patience and probably some help from the people at your hobby shop to get the fuel/idle-mixture/needle-valve/glow-plug/throttle-curve recipe just right.

When the engine idles and runs reliably, beginners can learn hovering and flying very nicely, but they mustn't be discouraged if the carburetor has to be adjusted more often than those of larger helicopters. Experienced pilots will enjoy having the MH-10 as a second or third helicopter.

The Hirobo BK-117 fuselage is a handsome addition to any flight line. I've never mated a fuselage to a set of mechanics any faster than with this helicopter—mostly because all the window openings were already cut out. The decals could use more color, but the polystyrene used for the fuselage opens up a lot of possibilities for masking-tape and airbrush fanatics. I especially like being able to get a fuselage ship through tailgates and doors with one hand. For pilots who have been in the hobby for less than a few seasons, the MH-10/BK-117 combination is an excellent choice for a first scale helicopter.

Congratulations to Hirobo for breaking new ground, not only with a new size, but also with a fresh design in its mini-helicopter.

**Here are the addresses of the companies mentioned in this article:*

Hirobo; distributed by Altech Marketing, P.O. Box 286, Fords, NJ 08863

O.S./Great Planes, P.O. Box 4021, Champaign, IL 61820.

Enya Model Engines; distributed by Altech Marketing.

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TOOLING UP

(Continued from page 102)

Balancer. The rotor hubs must be balanced with a precision balancer, with and without the blades (depending on which method you use). The High Point* balancer allows balancing with and without blades for the main and tail hubs. The assembled hub is placed on a main shaft and then on the balancer, where it's allowed to stabilize with the heavy side down. The lighter side should then be properly

counterweighted until the sides are equal. (This is an over-simplification of the process, but this article deals with the tool, not with the technique.) Du-Bro has recently introduced a balancer similar to the High Point, and though I haven't used it, I'm sure that it's of high quality.

Miscellaneous. I have a wooden mallet (some bearings must be tapped gently into their blocks), metric rulers, tweezers, spare nuts and bolts. You'll find most of these tools in your hobby shop, and since many of them are also used for fixed wings, you should have no trouble finding them.

Some heli kit manufacturers market a tool kit specifically for their machines. These kits usually contain the bare necessities, and they often have something that fits no other helicopter. They might have just a few socket wrenches and a ball-link tool or full sets of socket wrenches (nut drivers), Allen drivers, pliers, headlocks for the flybar, and balancing shafts for the tail rotor. They all fit into a convenient, custom-made case.

Your tools should be easy to reach, easy to transport, and kept in good condition. I use a commercially made, sturdy toolbox with several drawers. Choose your tools carefully. Before buying them, examine them and test the way they feel in your hand. A little care taken at the time of purchase will pay off in the long run.

**Here are the addresses of the companies mentioned in this article:*

Du-Bro, 480 Bonner Rd., Wauconda, IL 60084.

Bondhus Tools, 1400 E. Broadway, Box 660, Monticello, MN 55362.

GMP, Gorham Model Products, 23961 Craftsman Rd., Calabasas, CA 91302.

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